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USSR Report

MACHINE TOOLS AND METALWORKING EQUIPMENT

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USSR REPORT
MACHINE TOOLS AND METALWORKING EQUIPMENT

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INDUSTRY PLANNING AND ECONOMICS

BALMONT VIEWS FACTORY AUTOMATION UNDER TWELFTH FIVE-YEAR PLAN

Moscow KUZNECHNO-SHTAMPOVOCHNOYE PROIZVODSTVO in Russian No 3, Mar 86 pp 2-5

[Article by B. V. Balmont, Minister of the USSR Machine Tool Building and Tool Industry [Minstankoprom]: "Results of the USSR Minstankoprom Work in 1985 and Problems for the 12th Five-Year Plan "]

[Text] The year 1985 just ended is significant not only because it completed the 11th Five-Year Plan. In 1985 by the will of the party and the people many new great jobs began which we must persistently continue in the coming year and subsequent years. In his new year appeal to the Soviet people, M. S. Gorbachev, General Secretary of the CPSU Central Committee, stated that we are only at the start of the way, determined by the April (1985) Plenum of the CPSU Central Committee; at the very start of complicated work and great changes which demand from us still greater efforts, selflessness, fearless rejection of everything that has outlined its use, inertia in thinking, customary but useless arrangements and approaches of today.

In the great and creative work on accelerating scientific technological progress in the national economy machinebuilding sectors of industry play a leading role while within machinebuilding three sectors, including machine tool building and the tool industry, were named the priority ones.

The basic problems for the development of machinebuilding in the 12th Five-Year Plan period and up to the year 2000 have been determined.

In 1981-1985, the machine tool and tool industry increased the volume of production by 33.5 percent and the productivity of labor -- by 35.4 percent as against 30.7 percent per plan. In five years, sector enterprises manufactured and delivered to the national economy about 790,000 metal-cutting machine tools, including 173,000 special machine tools and 46,000 NC machine tools.

Some 202,000 forge press machines, over 1470 sets of automatic machine tool lines and 350 sets for forge-stamping were manufactured.

Basic efforts in the 11th Five-Year Plan period were concentrated on changing the output structure by raising the share of the most progressive and productive types of equipment and tools.

Thus, the ratio of special machine tools in the total output (with respect to costs) increased during the five-year plan from 40 percent in 1980 to 46 percent in 1985 and that of NC machine tools -- from 12 percent to 37 percent.

The share also increased of progressive types of equipment in the production of forge-press machines, casting and woodworking equipment. Taking this into account, the scales of production made it possible to increase the annual output productivity for the five-year plan period 1.5-fold.

In 1985, the tasks of the state plan and socialist obligations were fulfilled for the basic volume and economic indicators. The plan for the sales volume was implemented by 101.2 percent.

The planned tasks for abrasive and diamond tools, technological fixtures and consumer goods were overfulfilled.

In spite of the general positive results of the work in 1985, there were also shortcomings.

The following annual output plans were underfulfilled: forge-press equipment (92.7 percent), casting equipment (96.7 percent) and woodworking equipment (98.7 percent).

A number of large enterprises, such as the Pinsk PO [Production Association] of forge-press Automatic Lines, the Ivano-Frankovsk "Karpatpressmash" PO, the Azov Forge-Press Plant, the Chimkent PO for manufacturing forge-press equipment, the Odessa "Pressmash" PO and the "Soyuzmash" VPO [All-Union Production Association] did not fulfill the plan for practically all indicators during the entire year.

One of the most important indicators of the activity of enterprises and sectors as a whole is the implementation of plan tasks for new equipment.

During the past five-year plan period about 3600 prototypes were created and 3000 installation series were assimilated. Over 1200 outdated products were removed from production. The production volume of automatic equipment increased.

At the same time, the plan for the development of science and technology on creating and assimilating new kinds of industrial products in 1985 for the ministry as a whole was fulfilled by 99.1 percent, while the tasks of the state plan were fulfilled by 92.3 percent.

Certain work was done on reequipment. 1.3 billion rubles were spent for this purpose in the 11th Five-Year Plan.

Reequipment made it possible to reduce the number of workers doing manual labor, freed conditionally 72,000 persons and saved 55.5 million rubles of material and fuel-power resources. Production costs were reduced by 209 million rubles. The productivity of labor due to the implementation of scientific technological measures increased by 13.3 percent.

As is well known, capital construction is of decisive importance in forming production potential.

For the entire years of the 11th Five-Year Plan, the plan for capital investments in production construction was assimilated by 94 percent, including assimilation in construction-installation work -- by 82 percent.

In 1985 the plan for capital investments for the sector as a whole was assimilated by 95 percent, including assimilation in construction-installation work -- by 86 percent.

As before, the organization level of design and construction work remains low on the part of the Design and Capital Construction Administration, and the responsibility of enterprise and main administration managers for implementing construction is not great enough. As before, many managers look at construction as the job of the builders alone, forgetting that construction is tomorrow's day of the enterprise.

M. S. Gorbachev, General Secretary of the CPSU Central Committee, noted in his report at the June (1985) conference of the CPSU Central Committee on the question of strengthening scientific technological progress, that in the reequipment of the national economy. "the main key role in implementing the scientific technological revolution belongs to machinebuilding."

The general problem of the sector in the 12th Five-Year Plan period and up to the year 2000 is the creation in machinebuilding of a mobile, highly automatic pool of metalworking equipment for the production of the entire planned volume of machinebuilding output in year 2000, keeping manpower requirements at the 1985 level and without increasing the quantitative composition of the equipment pool.

Specific indicators of the 12th Five-Year Plan period and the plan for 1986 also follow from the general problem. In the five-year plan period it is necessary to increase the production volume by 53 percent (it increased by 33.5 percent in the previous five years).

The output of machine-tools will increase at accelerated rates -- by 57 percent (in cost terms) and forge-press equipment -- by 68 percent. Still higher rates of growth are specified for all progressive equipment groups, including special machine tools -- 2.1-fold, automatic and semiautomatic machines in all technological groups -- 2.3-fold. The quantity of NC machine tools will increase 2.1-fold, including machine centers -- 6-fold. The output of flexible automatic modules will increase 2.7-fold and industrial robots -- 4.3-fold.

In 1986-1990 it is planned to increase the production of consumer goods 1.5-fold, primarily by assimilating new products in greater demand by the people.

The production and economic indicators plan, approved for 1986, follows from the Basic Directions for Economic and Social Development of the USSR for 1986-

1990 and the period up to the year 2000 and, in its intensity and rates of growth, exceeds considerably the plan indicators achieved in 1985.

The share of types of progressive equipment will increase from 43.3 percent in 1985 to 85 percent in 1990. The output of NC forge-press machines will increase 2.6-fold.

The Minstankoprom developed work on preparing measures for a radical increase in the technical standard, reliability and quality of products planned for output in the 12th Five-Year Plan and the period up to year 2000.

Head institutes of the sector together with the SKB [Special Design Bureau] are developing a specific program for assimilating new types of machines with higher productivity, accuracy and reliability of equipment and a savings of material and power resources.

The general problem is solved -- to raise the productivity of equipment 1.5 to 1.6-fold, reduce unit metal consumption by 12 to 18 percent and unit power consumption by 7 to 12 percent.

Comprehensive target programs "Technical standard," "Reliability" and "Quality" are being developed for the realization of the posed problems.

The general ministry programs are the basis for the development by each enterprise of their own target programs to achieve the highest technical standard of output.

The programs developed by the enterprises must specify a reduction of time between scientific research and design to series output to 1/3-1/4. It is necessary to reduce the time from the start of development of the project to the start of series production to 1.5-2 years.

Speaking of raising the technical standard and quality of equipment output, we should emphasize that the sector should be supplied with the most important complementing units.

The Minpribor [Ministry of Instrument Making, Automation Equipment and Control Systems] enterprises in 1985 alone had a shortfall of 732 NC systems. Questions of supplying software to controllers are not solved and complete control and drive systems are not being supplied.

In December 1985 a joint order was issued to provide complementing products for the equipment manufactured in the 12th Five-Year Plan period. A joint decision by the Minstankoprom, Minpribor and Minelektronprom [Ministry of Electronics Industry], now in process of approval, is developing and creating modern systems with NC. The problem of the Main Technical Administration, Chief Production Administrations and Main Institutes is to insure the timely implementation of these decisions.

The share of new high efficiency equipment in the 12th Five-Year Plan period should be increased. Special attention should be given to the creation of flexible production modules.

All 23 types of GP [Flexible Production] modules, whose creation is specified by the State Plan for Development of Science and Technology for 1986, must have the most advanced technological solutions. The Middle-Volga Machine Tool Plant, the "Krasnyy proletariy" PO, the Ryazan Machine Tool Building PO, the Ivanovsk SPO [Consumer Societies Union], the Odessa Plant of Precision Machine Tools, the Leningrad SPO imeni Sverdlov, the Vitebsk Machine Tool Plant imeni Kirov, the Voronezh PO for Production of KPO, the Azov KPO Plant must not only manufacture and release prototypes, but also prepare production for their broad output. This indispensable condition must be sustained and main administrations and deputy ministers monitor the organization of this work.

Along with raising the technical standard of the manufactured products, it is necessary to do a great amount of work to raise the technical standard of our own production enterprises.

The basic thrust is toward accelerating scientific technological progress in existing production facilities by reequipment and modernization. Over more than double money is allotted for this purpose in 1986-1990 than in the 11th Five-Year Plan period.

The ministry is directing the spending of the basic part of the money on the reequipment and modernization of production associations and enterprises for the output of progressive equipment, with a planned increase in production capacities of 1 billion rubles. It is especially important to obtain high technical standards, organization and production culture, produce modern equipment and increase the outout of NC machine tools, machining centers and GP modules.

To produce 9000 NC machine tools of the machining center type, it is planned to concentrate their production at 14 PO and enterprises. In order to raise the level of fitting out machining centers and GP modules with tools, fixtures and monistoring-measuring devices, respecialization and reequipment of three more enterprises in the sectors will be implemented. Plants will be built and introduced into operation in Moscow and Leningrad for the production of complete production control systems. In the very near future, it will be necessary to define the technological processes and the composition of equipment of these enterprises.

In 1986 existing production facilities must introduce 11 flexible production systems, over 1000 units of high productivity equipment, 170 machining centers, 24 automatic and semiautomatic lines and realize a series of other measures specified by the target programs of the sector.

Managers of scientific technological organizations must review the structure, concentrate their forces and means in the most important strategic directions, and eliminate low efficiency subsections. It is necessary to introduce in practice the creation of temporary collectives which include subsections of various organizations for solving the biggest problems.

Managers of scientific research institutes and enterprises must become involved in strengthening the experimental base for the development of which the ministry is allotting 480 million rubles or 8 percent of all capital investments in the 12th Five-Year plan period. Computers and automatic design systems should be used more widely.

Cooperation plays an important role in solving problems faced by the ministry in the field of accelerating scientific technological progress on the basis of the Comprehensive Program for Scientific Technological Progress of CEMA member countries to the year 2000, adopted at the 41st meeting of the CEMA. It is an integral part of the external economic strategy of the party for the future and inseparably tied to the implementation of tasks specified by the basic directions of the economic and social development of the USSR in 1986-1990 and the period up to the year 2000.

The necessity of a more active application of new forms of economic and scientific technological cooperation with CEMA country members is recognized. The first steps in this direction have already been taken. In October 1985 a Soviet-Bulgarian agreement on establishing two scientific production associations was signed:

to create and produce machining centers, GP modules and systems on the basis of the Ivanovsk SPO, production association ZMM and a plant for making NC systems and controllers by the NRB,

to create and produce NC machine tools and GP modules for machining solids of revolution parts on the basis of the Moscow "Krasnyy proletariy" SPO and the "Beryoz" Scientific Production Enterprise for Manufacturing Control Devices (NRB).

At present, the indicated NPO approved plans for producing equipment and complementing products for 1986.

To improve forms of international cooperation a decision was adopted to organize an "Interrobot" International Scientific Production Association whose basic problems are the implementation of a single technical policy and the achievement of world level in the field of creating robot equipment for subsequently producing them on a wide scale on the basis of specialization and cooperation.

The realization of the problems posed before the sector on accelerating the automation of machinebuilding required a radical change in existing preparation and an increase in the skill of leading workers and specialists.

In the 12th Five-Year Plan period, it is planned to increase the scales of preparation of specialists on new equipment. The institute for increasing skills will train over 22,000 persons, and technical schools will train over 12,000 persons. At sector enterprises that manufacture new equipment, it is planned to organize training centers for the preparation of engineers, technicians and worker personnel for their own needs, as well as for sectors that use the equipment.

It is necessary to start immediately the creation of proper training bases on the site, to plan and organize timely preparation, and to retrain personnel in the field of automatic production.

In setting up high rates of growth and complicated technical problems for our sector, the government is allotting to our ministry considerable means for the development of the production potential.

Six billion rubles of capital investments were allotted for the 12th Five-Year Plan period. It is planned to introduce capacities for consumer goods to an amount of 4.5 billion rubles.

An increase in the technical standard of their own production is planned primarily by the reequipment of existing enterprises. Of the money budgeted for industrial consumption in 1980-1990, 52 percent is allotted for this purpose.

The increase in capacities due to reequipment will be 2/3 of the total introduction of capacities.

Great problems in the 12th Five-Year Plan period are posed before the industry which manufactures products for general machinebuilding application.

By changing the specialization of a number of enterprises, it is necessary to create capacities for sliding bearings, solids of revolution parts and a number of other products which previously was not produced in a centralized manner in the Minstankoprom.

In 1986 a limit of 763 million rubles of capital investments was approved for production construction, including 182 million rubles for construction-installation which are respectively 140 percent and 133 percent as compared to 1985.

It is planned to increase the capacities of capital investments by 277 million rubles. In this case, 66.3 percent of the increase will be due to reequipment.

At present, the ministry is completing the reorganization of management and the organizations of the sector, as well as the structure; management personnel will be reduced.

The reorganization at enterprises of the organization and the central staff will facilitate the system for controlling the technical progress in the sector, and will raise the professional standard of the managing staff and the engineering and technical workers.

All the adopted measures in radically improving the technical progress, raising technical standards and the quality of products manufactured by the sector must solve the problems posed before the Minstankoprom by the CPSU Central Committee and the USSR Council of Ministries. The creative initiative of the

multithousand collective of the center must be directed toward a very rapid realization of the developed measures, and the successful implementation of plans and socialist obligations for the 12th Five-Year Plan.

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INDUSTRY PLANNING AND ECONOMICS

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STRATEGY OF TECHNICAL PROGRESS

Moscow MASHINOSTROITEL in Russian No 2, Feb 86 pp 1-2

[Unattributed article: "Strategy for Technical Progress"]

[Text] The USSR Supreme Soviet has confirmed the country's State plan and budget for the first year of the five-year plan. Special attention is devoted in the 1986 plan to development of science and technology. The most important generalizing indicators of scientific and technical progress of the sectors and an increase of its efficiency have been included for the first time in the assignment for the year. No fewer than two-thirds of the increase of social labor productivity must be achieved during the 12th Five-Year Plan by utilizing the advances of science and technology. The 1986 plan includes 1,150 tasks for priority and intersector directions of science, engineering and technology, having the most important national economic significance, including that to design and develop models of new-generation machines and equipment.

The party views acceleration of scientific and technical progress as the main direction of its economic strategy and the main lever for intensification of the national economy. The requirement of time is to achieve a decisive turn of science towards the needs of production and of production toward science. This means that all sections that connect science, engineering and production must be strengthened and conditions must be created so as to implement rapidly everything new and progressive in practice.

A fundamental increase of the technical level of production is determined by introduction of high-production means of labor, by acceleration of production and by wide-scale introduction of highly efficient new-generation equipment. Machine-building occupies the key positions in solution of these problems. The volume of production of this sector will increase by 6.6 percent during the first year of the new five-year plan. The output of flexible manufacturing modules and automated systems, industrial robots and other modern equipment will increase. To acceleration and modernization of production in all sectors of the national economy, it is planned to reduce the number of obsolescent basic production funds over 50 percent in 1986. This work will be implemented uniformly on the basis of certification of workstations and of making them more efficient. This year, 37.4 billion rubles of state capital investments, which is 23 percent greater than last year, is being directed toward technical reequipping and renovation of existing enterprises. The timeliness of effective utilization of the allocated funds is being increased in this regard.

Technical reequipping of existing enterprises provides higher economic effectiveness of capital investments in most cases than new construction, expansion and even renovation. The deadlines for assimilation of capital investments are reduced and their return in the form of additional products and profits is considerably faster. A significant social effect is usually achieved: environmental protection, safety techniques and working conditions are improved and the number of workers engaged in heavy manual labor is reduced.

Of course, these high results can be achieved only with careful substantiation of the versions of technical reequipping, by the use of leading advances of science and technology in designs that make it possible to achieve the highest socioeconomic effect under specific production conditions. Priority development of machine tool-building, instrument building and computer hardware is envisioned in the 1986 plan to achieve technical reequipping of production on the basis of modern advances of science and technology. Thus, production of computer complexes based on microprocessors and personal computers will increase 1.8-fold. Capital investments in machine building will increase by more than 30 percent this year compared to 1985, including by 55 percent in instrument building and by 42 percent in machine tool-building.

High rates of development of production require extensive expenditures of energy, fuel and construction materials. Output and production of them will also increase. However, the basic source of supporting the growth of production by all types of resources becomes conservation of them. It is planned to support an increase of the needs of the national economy for ferrous rolled metals by 67 percent, for fuel and energy resources by 51 percent and for cement by 93 percent due to conservation. The use of secondary resources will be expanded considerably. Use of them will make it possible to free primary raw material worth approximately 13 billion rubles. Very intensive tasks to reduce the norms of consumption and to conserve resources have been established for each sector. Strict fulfillment of these tasks is a decisive condition for balancing the plan and rhythmic operation of all sectors of the national economy.

The most important direction of scientific and technical progress is to improve production technology. It is planned to expand 1.5-2-fold the use of progressive basic technologies during the 12th Five-Year Plan. Extensive introduction of essentially new technologies: electron beam, plasma, pulse, biological, radiation, membrane and chemical--is planned.

A large step must be made in automation of production. Its level will increase approximately twofold during the 12th Five-Year Plan. Primary introduction of automated systems in design, control of equipment and production processes will contribute to an increase of organizational and production flexibility. The production of computer hardware should be increased 2-2.3-fold during the 12th Five-Year Plan.

The main reference point in production with regard to the postulated problems will be higher world advances. The fraction of industrial product of higher category of quality should be increased 1.9-2.1-fold during the 12th Five-Year Plan.

The tasks advanced by the party for structural and technical restructuring of production require continuous improvement of management and of the economic mechanism. More than half of all industrial product will be produced in 1986 by enterprises operating under new conditions.

The situation must be fundamentally improved and the force of inertia in economic activity must be decisively overcome. An example of an effective business-like approach to problems of accelerating scientific and technical progress and technical reequipping of production are shown by the country's leading collective. The initiative of the Association AvtoVAZ is supported widely indifferent sectors of the national economy. The collectives of many enterprises have decided to exceed the control tasks of the 12th Five-Year Plan and to increase considerably product output meeting the most modern requirements on the basis of maximum use of the advances of science and technology at the call of the Volzhsk Automotive Plant workers.

Implementation of the 1986 plan will be of special significance for turning the national economy toward the path of intensification and for increasing the efficiency of production. The tasks of the plan for the first year of the five-year plan are intensive, but quite realistic. To achieve them, production potential, especially the human factor, must be used more fully in each labor collective. It is important to utilize productively each working hour and to strengthen by an order of magnitude labor and production discipline in production. The Soviet people recognize that the guarantee of fulfilling all our plans is high organization and personal responsibility for the entrusted matters and concern about increasing the might of our Motherland.

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INDUSTRY PLANNING AND ECONOMICS

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SEVENTH PLENUM OF CENTRAL ADMINISTRATION OF SCIENTIFIC AND TECHNICAL SOCIETY OF MACHINE-BUILDING INDUSTRY

Moscow MASHINOSTROITEL in Russian No 2, Feb 86 pp 8-9

[Unattributed article under the rubric "In the Scientific-Technical Society": "The 7th Plenum of the TsP NTOMashprom [Central and Moscow Municipal Administrations of the Machine-Building Industry Scientific and Technical Society]"]

[Text] The Seventh Joint Plenum of the Central and Moscow Municipal Administrations of the Scientific and Technical Society of the Machine-Building Industry was convened on 21 December 1985 in Moscow. The problem "On the draft of the basic directions for the economic and social development of the USSR for 1986-1990 and for the period up to 2000 and of the problem of the Scientific and Technical Society of the Machine-Building Industry on fundamental acceleration of scientific and technical progress and for a worthy meeting of the 27th CPSU Congress was considered at the plenum. The deputy chief of the Machine-Building Administration, USSR GKNT [State Committee for Science and Technology] comrade V. N. Petrichenko gave a report on this problem.

It is noted in the decree adopted by the plenum that the scientific and technical society of the machine-building industry, like all Soviet people, welcomed the decisions of the October (1985) Plenum of the CPSU Central Committee and the report of General Secretary of the CPSU Central Committee Comrade M. S. Gorbachev at it with enormous enthusiasm and patriotic fervor. The measures of the Soviet government to strengthen peace on earth and to consolidate the economic and defensive might of the USSR evoke warm approval of the society members.

The scientific and technical society fully supports the drafts, approved by the plenum, of the new edition of the Program of the Soviet Communist Party, and of the Basic directions for the economic and social development of the USSR for the 12th Five-Year Plan and for the period up to 2000 and also changes in the By-laws of the CPSU. The program goals, nodal problems of the general line of the CPSU, its economic strategy and format and methods of work among the masses at the modern phase were clearly outlined in the documents considered by the plenum.

The plans of the party rest on a firm foundation. A powerful economic, scientific and technical and cultural potential has been created through the labor of the Soviet people. Approximately 17,000 new types of machines, equipment, apparatus, automation hardware and other industrial products were

assimilated during the 11th Five-Year Plan with the active participation of the scientific and technical societies. The structure of output product is being improved sequentially due to more rapid growth of production of its more progressive types, specifically, of machine tools with numerical program control, of machine tools of the "machining center" type, computer hardware, industrial robots and automatic lines. Investigations are being conducted at accelerated rates on introduction of automated complex production process management systems. According to the tasks of public scientific and technical programs during the 11th Five-Year Plan, more than 2,700 objects of new equipment and technology have been developed and brought to practical use in the national economy. They include approximately 1,000 new types of machines and equipment and more than 750 progressive production processes.

The country's labor collectives have organized an all-union socialist competition for a worthy meeting of the 27th CPSU Congress. The Scientific and Technical Society of the Machine-Building Industry of Moscow, Leningrad, Kuybyshev, the Ukrainian and Belorussian SSR, other republics, krays and oblasts, having become active in the all-union competition for a worthy meeting of the 27th CPSU Congress, have adopted and are successfully fulfilling creative pledges in honor of the party congress, directed toward increasing production efficiency and intensification of production, toward introduction of labor-conserving equipment and technology, toward reducing materials consumption of articles and energy consumption of production, toward an increase of return of investment and toward an improvement of product quality.

The draft of the Basic directions for the economic and social development of the USSR for 1986-1990 and for the period up to 2000 is a document of enormous political significance. The party's economic strategy is revealed in it and the propositions of the draft of the new edition of the CPSU Program are materialized, which are translated to the language of specific planned tasks with respect to this crucial stage of its implementation as are the 12th Five-Year Plan and the period up to 2000.

The main task of the five-year plan is to increase the rates and effectiveness of developing the economy on the basis of acceleration of scientific and technical progress, technical reequipping of industry, intensive use of the created production potential, improvement of the management system, of the economic mechanism and in achieving on this basis a further rise of the well-being of the Soviet people.

Crucial tasks have been posed to the machine-building sectors of industry. The sectors and plants that determine scientific and technical progress must be developed at advance rates. It has been proposed that machine-tool building be developed at especially accelerated rates and primarily by the most progressive types of equipment--machining centers and flexible manufacturing modules and systems.

The volumes of production should increase by 33 percent in heavy and transport machine-building, by 40 percent in power machine-building, by 45 percent in chemical and petroleum machine-building, by 39 percent in construction, highway and municipal machine-building, by 45 percent in tractor and agricultural machine-building, by 49 percent in machine-building for animal husbandry and

fodder production, by 54 percent in machine-tool building and by 40 percent in machine-building for the light and food industry during 1986-1990. It is planned to achieve the entire increase in production by an increase of labor productivity.

New technical renovation of the national economy should be achieved and the material and technical base of society should be transformed on this basis. The most progressive production and flexible plants will be used. Electrification, chemization, robotization and computerization of production will be implemented and biotechnology will be used on ever broader scales. All this will make it possible to increase the country's national income almost twofold within the next 15 years, to increase social labor productivity 2.3-2.5-fold and thus to take a decisive step in implementation of the program task-- to achieve the highest worldwide level for this indicator.

Based on the tasks posed at the October (1985) Plenum of the CPSU Central Committee, the Seventh Joint Plenum of the Central and Moscow Municipal Administrations of the Scientific and Technical Society of the Machine-Building Industry completely and fully approved the draft of the Basic Directions for the country's economic and social development. Proposals to this draft, coming from the sections of the Central Administration and local administrations of the scientific and technical society of the machine-building industry, were also approved. The plenum entrusted the Presidium of the central administration of the scientific and technical society of the machine-building industry to send the proposals introduced by the participants of the joint plenum to VSNTO [All-Union Council of Scientific and Technical Societies].

The central, republic, kray, oblast and municipal administrations and councils of the primary organizations of the Scientific and Technical Society of the Machine-Building Industry have been asked to direct their organizing work toward further mobilization of the creative efforts of scientists, engineering and technical personnel, workers and all members of the scientific and technical society toward a worthy meeting of the 27th CPSU Congress, toward preparation of a reliable basis for supporting the plans of the 12th Five-Year Plan, being guided by the decisions of the April (1985) Plenum of the CPSU Central Committee and by the goals of the meeting at the CPSU Central Committee on problems of acceleration of scientific and technical progress.

The plenum obligated the Central Administration of the Scientific and Technical Society of the Machine-Building Industry, with recruitment of the committee on new technology, to consider the results of fulfilling the creative pledges by the primary organizations, created brigades and numbers of the scientific and technical society in honor of the 27th CPSU Congress. It is planned to award the organizations and members of the scientific and technical society who have successfully fulfilled their pledges with memorial banners, certificates and medals.

The central, republic, kray, oblast and municipal administrations and councils of the primary organizations of the Scientific and Technical Society of the Machine-Building Industry should render active assistance to the production collectives in fulfilling the planned tasks for 1986. Special attention should be devoted to problems of developing those catalysts of scientific and

technical progress as microelectronics, computer hardware and the entire informatics industry. The efforts of the society should be directed toward study of leading experience in intensification and technical improvement of production, acceleration of scientific and technical progress, intensification of the conditions of the economy, reduction of the use of manual labor, increasing the quality and reliability of products, implementation of plans of new technology, scientific and technical and socioeconomic programs, primarily food and energy programs, development of consumer goods production and of the service sphere and adoption of social measures to disseminate them widely.

The plenum has called upon members of the society to utilize more fully all available resources and capacities and primarily the human factor for sequential and vigorous fulfillment of the tasks posed by the party. Creative cooperation of the collectives of enterprises and organizations must be universally consolidated by reducing the "research-production" cycle, extensive dissemination of the practice of engineering support of fulfilling the plans and socialist pledges of the production brigades must be achieved, public expertise of the designs of machines and equipment must be implemented and a network of consultation points of the scientific and technical society must be developed. Public support of fulfilling the tasks of the scientific and technical programs must be improved. Young people must be recruited more actively to the work of the scientific and technical society.

It has been proposed that the primary organizations of the scientific and technical societies of associations, enterprises and organizations, councils of scientific organization of labor, laboratories and economic analysis groups and creative brigades participate directly in certification of workstations and making them more efficient, in developing designs for renovation and technical reequipping of plants and enterprises, by providing the use of leading production processes, high-performance equipment, means of automation, progressive solutions on organization of production and labor and support of proportional development of the capacities of basic, auxiliary and maintenance designation. Technical conservatism must be decisively overcome for this purpose, relying on the creative activity of collectives, without leaving cases of interruption of intended plans for introduction of scientific developments and leading experience without fundamental analysis, to support the movement of labor collectives of such production associations as AvtoVAZ, ZIL and also of the Machine-Tool Building Plant imeni S. Ordzhonikidze and AZLK [Moscow Automotive Plant imeni Lenin Komsomol] for acceleration of the technological renovation of production.

The Joint Plenum of the Central and Moscow Municipal Administrations of the Scientific and Technical Society of the Machine-Building Industry has assured the CPSU Central Committee, the AUCCTU and VSNTO that the scientific and technical society of the machine-building industry will direct its efforts toward implementation of the historic decisions of the October (1985) Plenum of the CPSU Central Committee and toward implementation of the magnificent program for the building of communism.

The plenum confirmed the topical plan of work of the Central Administration of the Scientific and Technical Society of the Machine-Building Industry for 1986 and heard a question about the budget (estimate) of the society for 1986 and

confirmed the execution of the 1984 budget and also information about the work of the presidium of the Central Administration of the Scientific and Technical Society of the Machine-Building Industry for the period between the sixth and seventh plenums. The corresponding decisions were adopted on the considered problems.

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INDUSTRY PLANNING AND ECONOMICS

EXPANDING, ACCELERATING ADVANCED LABOR TECHNIQUES

Moscow TEKHNIKA I NAUKA in Russian No 1, Jan 86 pp 2-6

[Article by G. Stroganov, doctor of engineering, professor, deputy chairman, USSR Gosplan: "Machinebuilding -- Improving the Technical Level and Quality of Production"]

[Text] It was emphasized at the April 1985 CPSU Central Committee plenum that, "the party is advancing to the forefront the task of fundamentally accelerating scientific and technological progress as the main strategic lever for intensification of the economy and better use of the capability which has been acquired... Revolutionary advances are necessary -- a shift to fundamentally new technical systems and to latest generation equipment, which provide the greatest effectiveness. We are talking essentially about retooling all branches of the economy, based on the modern achievements of science and technology."

Machinebuilding, the priority development and all-round improvement of which ensures large scale introduction into production of the achievements of scientific and technological progress, has a leading role in accomplishing this task. Machinebuilding is solving such major problems as satisfying the needs of the country for equipment to fulfill the Food and the Fuel and Energy programs; providing equipment and construction machinery for building the BAM [Baykal-Amur Main Line]; and for gas-pumping aggregates and mechanisms for main gas pipelines. In recent years, systems and complexes of machinery and technical equipment, industrial robots and flexible production modules and systems have been created which provide continuous, mechanized and automated production processes.

Highly effective equipment has been developed and is being produced for atomic electric power plants; the mining and petroleum extracting industries; ferrous and nonferrous metallurgy; transport and other economic branches. Production of an entire complex of power equipment for atomic power-generating units of 1-1.5 million kw capacity has been developed, as well as for a series of major power-generating units with individual capacities of 800,000 kw, intended for operation in Siberia on carbons from the Kansk-Achinsk basin. For the first time in worldwide practice equipment for atomic heat supply plants (AST) has been created and manufactured.

Production of a 5,250 cubic meter per hour, continuous operation machinery complex has been organized for stripping operations in quarries. A range of

parts-rolling mills for manufacture of economical billets for various machinery and equipment parts is being manufactured. The production of diesel engine trucks, as well as 14 ton load capacity dumping train cars for hauling agricultural products and 110-180 ton dumptrucks for work in quarries is being continuously expanded.

Our country is first in the world in the production of a number of most important types of equipment. These include equipment for atomic power; electric locomotives; combines; tractors, metal cutting machine tools and specialized equipment; diamond tools; agricultural machinery and other equipment. At the same time, the needs of the economy for modern, high level and high quality machinery are today still not being fully satisfied by the domestic machinebuilding industry.

One more urgent problem is replacing manual operations, heavy physical labor and non-prestigious, insubstantial and monotonous types of work. Their retention at a time of continuous rise in the cultural-educational and professional-technical level of the workers may lead in the immediate future to an acute shortage of labor resources in many sectors of production. In solving this task there is a definite role for retooling production with corresponding implements and labor devices -- both the most complex and relatively simple -- which reduce manual labor, and introducing systems of machinery for the mechanization and automation of lifting, transport, loading and unloading and warehousing operations.

The machinebuilding ministries are orienting themselves toward comprehensive replacement and active modernization of the equipment park in primary production. According to plan the level of mechanization and automation of the work of machine builders -- the largest segment of industrial workers -- will increase to 65 percent, and it will exceed 56 percent in loading and unloading, transport and warehousing operations.

LEADING TECHNOLOGIES

Special attention is being paid to increasing the productivity of the work of planners, designers, and technicians. More than 300 automated planning systems and automated work places will be created and introduced for them. Transforming the very process of work -- making it creative and increasing its effectiveness -- is directly associated with the widespread introduction of advanced working techniques and methods. Most of all this concerns developing and improving the effectiveness and the quality of the main, brigade form of labor organization and incentives. Under these conditions the opportunity is being created for expanding the functions of workers; accelerating the development of skills; introducing advanced labor techniques; developing creative activists, rationalization and inventiveness, which help to improve quality, raise the reliability of production and strengthen labor and technological discipline. The best confirmation of this is the extensive support of the initiative of the AvtoVAZ Association by the labor collectives.

The majority of branches which deliver raw materials, fuel and materials have reached scales of production the expansion of which is associated with significant increases in expenditures. In connection with this, machine

builders must more actively introduce into production resource-conserving technology and substitutes for metals, and use secondary resources. Last year the use of advanced resource-conserving technologies increased, including such technologies as economical types of cutting and stamping of billets from sheet steel and the production of products from metal powders, wear resistant coatings and hot plastic deformation methods. Thus, a system of low-waste technologies for the manufacture of shafts, axles and gears has been introduced at the AvtoZIL Production Association, which made it possible to improve the coefficient of use of metal to 0.72 and to reduce the expenditure of rolled metal by 30 percent. Technological processes for plastic shaping of parts under conditions of super-plasticity substantially improve savings of metal. For example, in the mill for rolling under super-plasticity conditions of parts up to one meter in diameter from difficult to deform alloys, at the Savelov Progress Production Association, a 5-6 fold increase in the coefficient of use of the metal is being achieved. Rolling of parts on this mill with numerically programmed controls is being carried out automatically with rapid rearrangement of the mill from machining of one part to another. Automated lines and flexible production systems can be created on the basis of such mills.

The development and introduction of advanced technological processes, based on new types of energy, lasers and less energy-intensive and no-waste or low-waste technologies is becoming of fundamental importance under modern conditions. Laser equipment is providing more than a two fold gain in basic indices of known technological processes and makes it possible to carry out entirely new operations. Thus, lasers are capable of cutting refractory metals, ceramics, cloth, plastic, wood and composition materials. The process takes place so rapidly that the surface is not heated significantly, the characteristics of materials in the area of the cut are virtually unchanged and the parts are not deformed due to residual stresses. The need for costly and rapidly worn-out cutting instruments made of super-hard materials is eliminated. The high quality of technological operations makes it possible to avoid subsequent processing of parts. Therefore, laser cutting is highly effective in shipbuilding and the aviation, electronics and other branches of machinebuilding for cutting materials, punching holes, cutting notches and stamping parts. Savings on cutting of up to 70 percent are realized.

In Minavtoprom [Ministry of the Automotive Industry] and Minselkhozmash [Ministry of Tractor and Agricultural Machinebuilding] the scale of use of parts and products with high-tenacity coatings is being expanded substantially, which is making it possible to reduce the need for spare parts for automobiles, tractors, and agricultural machinery by increasing their operating life.

It has been calculated that replacing uneconomical types of steel castings in welded structures will save up to 25 percent of the metal. In the overall structure of billeting production the share of welded metal work is already more than half and in the 12th Five-Year plan this tendency will be further developed. Advanced methods of welding -- electron beam, plastic, laser, explosion and resistance welding -- are having a great effect. As a rule they will be used as flexible automated lines and robotics complexes, increasing the coefficient of use of metal by 5 percent.

Enterprises which are actively involved in redesign and technical retooling of production will obtain significantly higher quality and increased volumes of production. Thus, the technological solutions adopted in the plan for redesign of the Moscow Electromechanical Factory imeni Vladimir Ilyich correspond to future directions for the development and introduction of new equipment and technology, which provide high mobility of production through the creation of flexible automated lines, sections and complexes based on the most modern equipment. Mechanization and automation of production processes; the creation of robotized complexes, lines and sections; automation of warehouses and transport systems; as well as finding comprehensive solutions to questions of the organization and management of production processes based on ASUP [Automated System for Enterprise Management], ASUTP [Automated System for Control of Technological Processes] and SAPR [Design Automation Systems] will make it possible for the factory, after completing its redesign, to improve substantially the quality of products; reduce 3-4 fold their labor intensiveness; and increase the output of products more than 3 fold at the same production sites, while reducing the number of workers. The creation of such processes will make it possible for Soviet industry to acquire necessary experience and subsequently to circulate this experience to many enterprises of different branches.

THE PLAN AND NEW EQUIPMENT

The machine building sectors are actively participating in a large scale economic experiment. Their enterprises are working more effectively and responsively, are more fully using intensive factors of economic development and are increasing production volumes basically without increasing the number of workers. The role of qualitative indices is increasing in the planning and evaluation of the activity of machinebuilding enterprises. A system of calculated analytical indices for scientific and technological progress is being introduced and their fulfillment is being supported by all necessary resources. In connection with this, the importance of responsibility and discipline and of economic levers and incentives in accelerating the creation, development and introduction into production of new equipment and technology; strengthening discipline pertaining to agreements which have been made; and increasing the share of machinery and equipment systems and complexes in deliveries, including those of unitized-modular manufacture, is increasing.

Meanwhile, the planning system and existing economic mechanism still does not completely facilitate the exploitation of the achievements of scientific and technological progress and of advanced Soviet and foreign experience. At present, even in branches which have shifted to economic experimental conditions, two planning and incentive systems operate in parallel. One is directed at increasing the volume of production and reducing the overall level of expenditures; the other at accelerating scientific and technological progress as the most effective means of increasing production volumes and saving resources. Enterprises receive better incentives and bear a greater burden of responsibility for fulfilling the plan for production volume and delivery of products according to agreements than they do for the production and introduction of new equipment.

As was emphasized at the June 1985 CPSU Central Committee Conference, in order to accelerate scientific and technological progress it is necessary to create conditions under which plan fulfillment and economic development would be impossible without the creation and introduction of new equipment and technologies. Therefore, at the new stage of the economic experiment its participants, with the aid of refined norms, must be directed toward the main objective -- the all-round acceleration of research efforts, development of new competitive machinery, instruments and equipment, introduction, assimilation and production of the achievements of science and technology, and the transfer and borrowing of advanced Soviet experience. In connection with this, a shift is being carried out to the creation of an integrated system for the management and administration of the country's machinebuilding complex.

Intensification of the development of the economy during 1986-1990 will depend largely on the rates of growth and capabilities of Soviet machinebuilding and the expansion of cooperation with the countries of the socialist community in the creation and production of the most modern machinery, equipment and instruments.

The main task is, during the 12th Five-Year Plan, to raise machinebuilding to a new and higher technical level and achieve better quality and more reliable products. It is no less important to organize mass production of new types of highly productive and competitive equipment, which meets the need of worldwide scientific and technological progress; to halt the production of obsolete items and, therefore, to satisfy the needs of the economy for machinery, instruments and equipment.

Priority tasks facing the machinebuilding branches include: further expansion of basic research and development, which provide a scientific reserve for the 12th Five-Year Plan and the longer-term future; development and creation of new capacities for the scientific, technological and experimental base; an increase in the technical level of production and the quality of products; and transition to the production of a new generation of competitive machinery, equipment and instruments based on modern organizational and technological solutions. Also necessary is the systematic and more effective use of the scientific-technological and production capability in the interests of accelerating the intensification of the entire economy; fulfilling the USSR Food Program and Energy Program and the Comprehensive Program for the Development of the Production of Consumer Goods and Services for the Period up to the Year 2000; the effective and more economical use of all types of resources, especially metal and secondary resources; and the development and introduction of advanced technological processes and new types of equipment.

Advanced kinds of plastic deformation of billets will receive further development, including extrusion, radial forging, rolling, hot-rolling, reduction, super-plastic shaping, and methods of hot-plastic deformation of metals. Economical techniques for cutting and stamping of billets from sheet steel and the manufacture of products with protective and wear-resistant coatings, as well as from metal powders will be further developed.

QUALITY AND RELIABILITY

The creation of new equipment which corresponds in its indices to the best worldwide models is organically linked with the development and use of modern, advanced materials. This problem is being solved most of all through the development of the metallurgical and chemical industries and through raising them to a qualitatively new level. It is enough to say that factories of the machinebuilding ministries consume more than half of all rolled ferrous metals and a substantial portion of non-ferrous metals. However, there is also a reciprocal relationship here. In order to obtain a sufficient amount of various types of materials it is necessary to increase the capacity and modernize the production of machinebuilding for the metallurgical and chemical enterprises, reduce the material intensiveness of machinery and equipment and lower the norms for the expenditure of rolled products. Metallurgists and chemists must increase the output of the most effective types of products, in order that light and durable goods can be manufactured from them. This will make it possible to raise substantially the quality of equipment being produced and its reliability and longevity.

In order to raise the technical level of machinebuilding production during the 12th Five-Year Plan it is planned to increase the rates of introduction of flexible production systems. Flexible production systems which have a wide range of products make it possible to shift rapidly to the production of related products, the production cost of which is close to that achieved under conditions of stable mass production. Measures are being taken toward extensive introduction of automated and semiautomated equipment with numerical controls, with the use of built-in microprocessor design and control systems. As a result of this, during 1986-1990 more than 300,000 people will be freed in the machinebuilding industry. By 1990 it is planned to increase the coefficient of removal of worn out and obsolete equipment in its branches.

The technical retooling of production, especially based on comprehensive solutions for the introduction of flexible production modules and systems, numerically controlled equipment and processing center type machine tools using electronic microprocessor equipment and many computers, will make it possible to improve fundamentally working conditions and to raise productivity. With the introduction of electronics based automated equipment the nature of labor of workers (machine tool operators and equipment repairmen) is also changing. It is becoming more creative and highly skilled, which helps increase labor productivity and solve a number of social problems.

Further intensification of production processes is planned, through the extensive circulation of future models of new equipment and technical, technological and organizational solutions; redesign and technical retooling of technologically backward enterprises; ensuring compatibility of primary and secondary production; and strengthening services for the preparation of production. The accelerated development at a number of enterprises and associations of ministries, of capacities for the production of special production equipment, accessories and tools for their own needs, is envisioned. Positive experience in this important direction has been acquired at Minavtoprom [Ministry of the Automotive Industry], Minselkhozmash [Ministry of Tractor and Agricultural Machinebuilding] and Minpribor [Ministry of

Instrument Making, Automation Equipment and Control Systems]. The carrying out of extensive certification and rationalization of technologies in enterprises will make it possible in two or three years to free the production sites of excessive, obsolete and physically worn out equipment, most of all in primary production. Capital repair of major and unique equipment must always be accompanied by thorough modernization, which guarantees a substantial increase in its main technical and operational parameters.

It is extremely important to expand and extend inter-branch specialization and cooperation of production and machinebuilding, as the main direction in the formation of capacities and development of mobile production. Extensive specialization of production, in combination with standardization and the use of unitized modular principles for the establishment of designs of new systems of machinery and equipment will make it possible to use more effectively processing centers, robotics complexes and flexible production systems, and to accelerate the time period for modernization of products being manufactured and raise their quality. The high technical level of production, quality of production and introduction of advanced technological processes will make it possible by 1990 to raise the reliability and operating life of the most important types of machinebuilding products, to improve fuel and energy savings and to reduce the metal intensiveness of machinery and equipment. The share of new machinebuilding products which have been produced for three years or less will increase 2 or 3 fold, while as a result of thorough modifications and replacement by new, highly effective equipment, the amount of products which have been produced for more than 10 years will decline substantially. It is planned, taking into account the requirements of the buyer, to organize the production of new generations of systems of equipment, automated machine tool lines and complexes of forging and pressing equipment and agricultural machinery and tractors, which will surpass those presently being manufactured in terms of productivity 1.5-2 fold, as well as fundamentally new types of equipment and technology, which are improving labor productivity no less than 3-5 fold.

SPECIALIZATION AND COOPERATION

In solving tasks of improving machinebuilding and satisfying the needs of the economy for machinebuilding products of a high technological level and quality, a most important factor is the further development of cooperation with the countries of the Socialist Community. A feature of the present stage of cooperation among the CEMA countries in the machinebuilding field is that it involves all stages of the creation and production of new equipment and is shifting to the development of machinery and equipment based on standardized aggregates, assemblies and parts, for the comprehensive solution of major branch and interbranch problems.

For the purpose of implementing tasks of accelerating scientific and technological progress and raising the technical and economic level of machinebuilding, the 39th CEMA Session Conference adopted a resolution about the formation of a CEMA committee for cooperation in the machinebuilding field. The scheduled session of the committee was held in Sofia in October of last year, at which a number of future and current issues of the activity of the committee and its standing working organs were examined. At the session a

plan for the work of the committee for 1986-1987 was approved, which envisions working out the Basic Directions for Economic and Scientific-Technological Cooperation in the Machinebuilding Field for 1986-1990, and future programs for the development of multilateral specialization and cooperation in production of selected items until the year 2000. The decisions of the committee are directed at providing key branches of production with machinery and equipment of high quality and improving the structure for increasing the output of advanced machinery and for technical reequipping of machinebuilding in the Socialist countries.

The guarantee of success in fundamentally accelerating scientific and technological progress is exemplary organization in all sectors of the process of scientific and technological creativity, from the generation of the idea to series production of the new product, and it is the duty of workers in the machinebuilding complex to do everything necessary to achieve the most rapid transition of industry to the intensive path of development, increase the effectiveness of social production, and to greet the 27th Congress of the Communist Party of the Soviet Union with specific deeds and new achievements.

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INDUSTRY PLANNING AND ECONOMICS

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PROBLEMS, PROSPECTS OF ECONOMIC EXPERIMENT SURVEYED

Moscow MASHINOSTROITEL in Russian No 10, Oct 85 pp 30-31

[Article by S. P. Vasin, candidate of economics: "The Economic Experiment: Experience and Problems"]

[Text] The economic experiment being conducted at a number of enterprises is having a positive effect upon their activities. There have been marked advances in the completion of contracted deliveries, materials and labor are better used, new technology is being more rapidly introduced, output quality improved, etc. This is vividly seen in the work experience of the PO Bryansk Machine Building Plant imeni V. I. Lenin: the association fulfilled the 1984 contracted delivery plan by 100 percent, commercial output sales volume was increased by 6.1 percent, normative net product by 10.3 percent; labor productivity increased by 8.1 percent, profit (balance) by 24.2 percent, the amount of output in the highest quality category by 4.8 percent; output prime cost declined by 1,350,000 rubles and average monthly wages increased by 4.5 percent. The annual plan for new technology was fulfilled for volume and assortment. The economic effect from its introduction was 25 million rubles. There was a considerable savings in materials. The targets for the production of mass consumption goods and major construction were overfulfilled. Thanks to the precise fulfillment of contracts and orders, an additional 632,000 rubles was allocated to the incentives fund. The fund for social-cultural measures and residential construction grew by 25.4 percent compared to 1983.

During the experiment a number of plant (sector based) methodological materials were elaborated at the association. These include enterprise standards which specified the system for organizing the planning of contracted deliveries, the manufacture and delivery of output on schedule, and control over its delivery in accordance with contracts and export orders. The signing of contracts is concentrated in the sales department, which gives the production control department (PDO) the contract assortment and shipping schedules. Taking the production cycle into account, production operations and shops are given plans and lists of contracts with totals and assortments. The completion of contracted delivery plans are monitored daily by the association management, production directors, the PDO and the sales department. This system for planning, accounting and controlling contracted deliveries has fully justified itself.

At the association there has been a reexamination of bonus regulations and new ones have been developed, based upon standard ones recommended by the ministry. There have been changes in the conditions for awarding bonuses to piece rate workers, main and auxiliary time rate workers, engineering-technical personnel and employees. While previously bonuses were paid mainly for the fulfillment of volume indicators, now they are differentiated for indicators such as the fulfillment of plans for sales volumes, taking into account delivery obligations in contracts and orders (bonuses are 50 percent of total bonus), for growth in labor productivity (25 percent), and cost reductions per ruble of commercial output (25 percent). If the output sales plan is not fulfilled, ITR and employees receive no bonuses (other than for cost reductions). New regulations have been worked out for awarding bonuses to ITR and employees for expanding the assortment and increasing the volume of machinery and equipment exported, on the formation and economical use of stimulation funds, etc. There have been sizable increases (an average of 10 percent) in the size of bonuses for ITR and employees working in sections on cost accounting, and increases in additional payments (doplaty) to leaders of brigades on cost accounting (up to 40 rubles).

In accordance with the economic experiment, at the association there have been introduced increased additional payments to wage rates for the professional mastery of skills by highly qualified workers engaged in especially responsible work (16, 20 and 24 percent respectively for workers in the fourth, fifth and sixth grades). Markups (nadбавки) have been established for ITR and employees with high qualifications, including designers and technologists. Each unit has been allocated a monthly fund to pay out such markups. This helps keep highly qualified engineering personnel at the association and improves the creative activities of ITR. Lump wages payments are used to increase the labor productivity of designers and technologists.

Socialist competition has been reviewed in connection with changes in planned economic indicators. Most measures in the socialist obligations are linked to the completion of plan targets, improvements in technology, the introduction of NOT [scientific organization of labor], the development of brigade forms of work organization and solutions to social-service questions. For brigade and workers collectives the basic form of obligations is the contract on socialist competition, while for ITR it is the personal creative plan. There has been an increase in the number of class places for victors in individual competition.

In order to enhance collectives' responsibility for the acceleration of scientific and technical progress, targets for new technology (including the creation of experimental models) have been included in shops' production plans. Control over the fulfillment of these plans is analogous to control over contract fulfillment. This helps accelerate the manufacture of experimental models and to some extent frees designers from control functions over the manufacture of components and parts in shops, material technical supply. etc.

Improvements in indicators under the new conditions are to a considerable extent explained by the extensive explanatory and organizational work that has been conducted in the association to mobilize the collective for plan fulfillment, to discover and use production reserves, improve its efficiency

and widely introduce cost accounting. The proposals arriving from shop and department collectives during the discussion of the experiment's tasks were given consideration by the appropriate services. The timely assignment of indicators, limits and economic norms to the association, and the better organization of material-technical supply at the enterprise had a positive effect upon work results under the new conditions.

An analysis of the first steps in the introduction of the economic experiment shows the need to continue the search for ways to accelerate technical progress, improve the use of productive resources and reduce costs. To accelerate the enterprise's technical renovation it is advisable to increase the production development fund by a factor of 2 or more. This will cover a larger share of resources for the technical reequipment of production. Labor collectives will thus be entrusted with real cost accounting responsibility for technical progress at the enterprise. The production development fund should be placed at the enterprise's full disposal. The present system for the elaboration and numerous coordination of draft plans for technical reequipment does not actually allow collectives to use the fund's resources for production development and retards technical progress. The procedure for this fund's formation also requires refinements. It should be more closely linked to final results than it is now.

It is necessary to increase collectives' responsibility for improving product technical standards. The report on the fulfillment of targets for savings in rolled metal should include economies from the production introduction of new, improved items with long operating lives. This will stimulate the creation of new equipment and savings in metal. There is a need to intensify incentives for the more complete use of productive capital. Material reserves at enterprises must be increased up to their established norms.

It is necessary to actually expand the enterprise's cost accounting independence and reduce the number of planning and evaluation indicators. The reduction in approved indicators and limits called for by the experiment has not been completely realized. Enterprises are still given a number of limits and indicators not included in normative documents. Thus, in 1984 the association was given targets for the expansion of multi-machine tool servicing, the organization of brigade forms of labor payment, reductions in labor intensiveness, limits on the administrative-management apparatus, job consolidation, etc. These indicators are rigidly controlled and some of them are used for awarding bonuses. In addition to these indicators there are also report indicators, for which the enterprise should present reports, just as with directives. It is apparently advisable to give enterprise directors the right the right to change monthly production plans within quarters, redistributing up to 20 percent of the planned total of funds for material incentives, social-service and cultural development. Obviously, it is more effective to increase (by 15 percent) the material incentives fund for the quarterly fulfillment of contracts and orders, and not for improving results since the first of the year.

Because the economic experiment increases the significance of profits, it is necessary to solve the question about expenses enterprises incur in patronage assistance and in sending their workers to do agricultural and construction

work. It is advisable to establish a procedure for enterprises to sign contracts for assistance to agriculture and construction, with obligatory compensation for labor and material costs.

There is still not a full answer to the question of enterprise financial reserves. The economic experiment authorizes the creation of such reserves (up to 5 percent of the enterprise's own circulating capital) through above-plan profits and markups on output with the State Sign of Quality. These are not realistic sources for the formation of financial reserves, as there are practically no above plan profits to allocate to this reserve after various expenses have been covered (payment of bonuses for socialist competition, allocations to circulating capital, additional allocations to the fund for material incentives to produce mass consumption goods, the fulfillment of contracts, the overfulfillment of plans for fund formation indicators, etc., etc.).

The more complete realization of the principles of the economic experiment, solutions to unsolved problems, and the search for better alternatives to their solution will help make a new step to improving the economic mechanism and improving production efficiency.

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INDUSTRY PLANNING AND ECONOMICS

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PROBLEMS IN INCREASING SHIFT COEFFICIENTS EXAMINED

Moscow MASHINOSTROITEL in Russian No 10, Oct 85 pp 39-40

[Article by G. G. Lyskova, engineer: "Experience in Increasing Equipment Shift Coefficients"]

[Text] Under contemporary conditions it is becoming very important to increase the efficiency with which the active component of productive capital is used. Equipment use surveys systematically conducted by the USSR TSSU [Central Statistical Administration] indicate that over almost 20 years shift coefficients have never exceeded 1.37. In basic production operations, where there is a large percentage of highly productive machinery, the shift coefficient was only 1.45 in 1983. Valuable equipment was not fully used. Not accidentally, at the April (1985) CPSU Central Committee Plenum it was noted that managers at many ministries and enterprises often have an irresponsible attitude towards the rational use of machine tools and other machinery, that equipment sometimes sits idle or is partially used and that it is necessary to struggle against this wastefulness.

It is important to improve the use of fixed productive capital. It has been calculated that only a 1 k. [kopeck] country-wide increase upon the return on fixed productive capital would result in more than 8 billion rubles of additional output.

Two main factors influence the shift coefficient of fixed productive capital use: the number of machine tool shifts worked and the number of units of equipment used in calculating this indicator.

At present, given the very slow entry of personnel into enterprises, the main means for increasing the shift coefficient is the implementation of organizational-technical measures making it possible to release machine tool operators for work on second and third shifts. The greatest effect is given by the development of multi-machine tool servicing and the expansion of service zones. This releases skilled machine tool operators and does not require their further retraining.

Similar to other progressive forms of labor organization (job consolidation, brigade organization of labor), when multi machine tool servicing is organized, there is an increase in each worker's labor sphere In its turn,

this is equal to increasing the total number of machine tool operators, and consequently, the number of machine tool shifts. Research shows that enterprises giving attention to the development of progressive forms of labor organization have, as a rule, higher shift coefficients for equipment operation.

The experience of a number of machinery building enterprises in Leningrad is of interest in this regard. By achieving a 20 percent increase in the number of operators servicing several machine tools, the turbine blade shop at the Leningrad Metal Plant PO for Turbine Construction increased the shift coefficient from 1.3 to 1.65.

Here the determination of indicators for the normative, plan and actual number of multi-machine tool operators for individual groups of machines takes into account their quantity, shift coefficient and servicing. In compiling actual values for this indicator, together with normative values, reserves in the organization of equipment servicing are discovered. These reserves are included in the development of measures creating the organizational-technical prerequisites for the further expansion of multi-machine tool servicing and job consolidation assuring the necessary number of multi-machine tool operators and the shift coefficient for the planned period.

The experience of progressive enterprises in other sectors can be used in machinery building. Work directed towards the consolidation of related professions is being done at the Baku Tire Plant. Here, at the first of the year, shop managers give their specific ideas about the further development of consolidation. Then, an order is published which specifies the number of workers to be reduced (in accordance with an approved list). Every month shop managers give the Labor and Wages Department a list of workers who could consolidate professions. They are trained in related professions directly at the enterprise or at special courses.

The use of multi-machine tool servicing and consolidated professions in brigades at the Kaluga Turbine Plant Association made it possible to conditionally release 12 percent of all workers at the association. As a result, in 3 years the shift coefficient of equipment operation at the plant increased from 1.24 to 1.55.

The problem of the machine tool operator shortage can be to some extent solved through the organization of comprehensive integral process [skvoznyye] brigades, which by the mastery of related professions and complete interchangeability will succeed in the redistribution of workers by stage in the manufacturing process and thus require fewer workers to complete the planned work volume.

The creation of comprehensive integral process brigades with equal valued links is acquiring ever greater significance. This will help improve the machine tool operator ratio for shifts. With the organization of such brigades at the Moscow Machine Tool Building Plant imeni S. Ordzhonikidze, by the end of 1984 approximately 60 percent of the total number of machine tool operators were working in the first shift, and about 40 percent in the second (at the

beginning of 1984 the ratio was 80 and 20 percent). As a result, the shift coefficient increased to 1.67 and the output-capital ratio grew by almost 2 percent.

There is great potential for increasing shift coefficients through the certification of work places, during which there is a comprehensive evaluation of the labor organization, conditions and productivity and the technical condition of each work places. The data obtained are used in the subsequent rationalization of work places and their technical reequipment, taking NOT requirements into account. As the result of certification in 1984 at the PO Volgograd Tractor Plant imeni F. E. Dzerzhinskiy, 274 low efficiency work places were eliminated, requirements for cadre were reduced by 450 people and the shift coefficient was 1.63.

A considerable effect is given by measures making it possible to free workers from other production sections, in particular, auxiliary sections (upon the condition of assuring the timely retraining of cadre). Thus, at the Baku Machinery Building Plant imeni Lieutenant Shmidt, the mechanization and automation of production processes and the introduction of progressive technology made it possible in 1983 to conditionally release 143 people, the great share of whom, after retraining in machine tool professions, were switched to basic production. Two, almost equal shifts are functioning at the plant. The shift coefficient for equipment is 1.71 for the enterprise as a whole and 1.74 in basic production.

Similar work on improving the use of machinery and equipment is being conducted at many machinery building enterprises. However, as statistics indicate, at the majority of them the shift coefficients are still low. The progressive experience of enterprises and organizations which have found successful ways of solving this task is of great interest. For example, at the plants of the VPO Soyuzneftmash [All-Union Petroleum Machinery], starting in 1975, systematic work is being conducted on improving the shift coefficients and every year measures supporting the more complete use of machine tools are worked out and introduced. As a result, in 1983 the shift coefficient of metal working equipment was 1.70, and in basic production, 1.73. Compared to 1975 equipment idle time was reduced by more than 14 percent, and the output capital ratio was increased by 9 percent.

The setting of normative shift coefficients during 1981-1985 for all machinery building enterprises in this association helped in discovering reserves for the effective use of equipment. They were worked out by the VNIIPTneftmash [Scientific Research and Planning-Technological Institute for Petroleum Machine Building], agreed upon with VPO Soyuzneftmash, approved by the ministry and sent to plants as targets for the 11th Five-Year Plan.

Every year association plants, together with the institute, work out measures to reach the planned shift coefficient. A central place among them is held by those which are directed towards increasing the number of machine tool operators and expanding multi-machine tool servicing: the introduction of new progressive equipment, increases in the number of machine tool operators by hiring PTU [Professional-technical academy] graduates, the training of workers in related professions, the release of auxiliary workers and their conversion

to basic production. Great attention is given to the modernization of obsolescent machine tools and the writing off of excess equipment. This is done according to a special list worked out for each enterprise. The measures plans provide for the servicing of shops in the evening shifts, the use of the services of the chief energy engineer and chief mechanic and the accumulation of the needed sets of spare parts prior to the beginning of scheduled equipment repair. Special attention is given to the observation of annual schedules for planned-preventive repair and control over the implementation of PPR [Planned-preventive repair] in shops and sections and improvements in repair quality.

Simultaneously with plan compilation, a calculation of equipment shift coefficients is made. The number of machine tool shifts worked, S, is determined using the following formula:

$$S = R^{ya} + \sum_1^{P_M} R^M p_M + \sum_1^{P_S} p_S p_S + C^N$$

Where R^{ya} -- is the number of machine tool operators servicing one machine tool ; R^M -- the number of machine tool serviced by multi machine tool operators; R^S -- the number of workers servicing machine tools under job consolidation; p_S -- the number of machine tools serviced by one worker under job condolidaion; S^N -- the number of machine tool shifts, worked by machine tool operators outside of fixed time.

The shift coefficient for equipment operation is obtained by dividing the number of machine tool shifts worked by the number of machines used in the calculation of the shift coefficient. This method is used for daily operational accounting of shift coefficient for metal cutting machine tools and forge-press equipment. The number of machine tool shifts worked daily is determined by equipment idle time cards filled out by formen at the ends of shifts. The reason for the idle time is indicated on the other side of the cards. Based upon these cards, the economic service compiles a report on equipment use during the past day by section and shift. It is given to the head of the shop by 9 AM the following day, and later given to the plant production control department, which compiles a summary report on the shift coefficient for the enterprise as a whole (including for basic equipment) which is given to the plant management every day.

However, it should be noted that this special system of accounting requires additional outlays of work time by formen and other engineering-technical personnel. Therefore, when applying the experience by VP Soyuzneftemash, other enterprises must more widely use automatic systems for calculating machine and equipment operation.

The coordination and development of organizational-technical measures at a higher level of administration (ministry) will make it possible to achieve better results simultaneously at many enterprises and to quickly solve tasks

in increasing the output-capital ratio and the rapid growth of labor productivity in machinery building. The experience of the Ministry of the Machine Tool deserves consideration. It has developed a targeted sectoral comprehensive program for improving equipment use and increasing its shift coefficient for 1981-1985 and up until 1990. Methodological instructions were prepared for the unique features in the analysis and evaluation of indicators at enterprises, production associations, VPO and administrations.

This program indicates the control values for the shift coefficient during the period examined for basic production and for machine tools with numerical control. It has 11 targets assuring the attainment of the planned shift coefficient level at subordinate plants and orientation targets for increasing the shift coefficient at the sector level. The program gives special attention to the certification of work places, makes provisions for the development of normative documents (methodological instructions) on this question and gives help to production associations and enterprises. In accordance with the program, every year at all levels (from ministry to enterprise) organizational-technical measures plans are developed. These indicate the deadlines for completion, the volume of work introduced and its economic efficiency. The implementation of these measures will help the ministry attain, during the 12th Five-Year Plan, an overall shift coefficient of 1.65 for basic production and 1.90 for numerically controlled machine tools.

Thus, the implementation of these organizational-technical measures and of goal directed and systematic work to improve the shift coefficient are helping to more fully use equipment and increase production efficiency.

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INDUSTRY PLANNING AND ECONOMICS

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LITHUANIAN EFFORTS TO REDUCE MANUAL LABOR

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[Article by Lithuanian Communist Party Central Committee Secretary N. K. Dybenko under the rubric "To Greet the CPSU Congress": "Reducing Manual Labor, the Focus of Attention of the Republic Party Organization"]

[Text] Increasing the effectiveness of social production, changing the economy over to a path of intensive development, is one of the most important elements of Communist Party economic strategy at the present stage and a reserve for our advance towards new frontiers of economic and social development.

As Comrade M. S. Gorbachev, General Secretary of the CPSU Central Committee, emphasized in speeches at the April and October (1985) CPSU Central Committee Plenums and at a CPSU Central Committee conference on questions of accelerating scientific-technical progress, resolution of these tasks will be possible only on the basis of cardinal acceleration of scientific-technical progress, of significant updating of production and of attaining the highest world level of labor productivity. Communists and all laborers in Soviet Lithuania greeted these party directives with warm approval.

The republic party organization is resolving large, complex tasks. Its work is moving ahead under the symbol of mobilizing all labor collective to create a solid base for consistent advancement of the policy of intensive development of the economy.

The time which has passed has been full of much creative work on carrying out the resolutions of the 26th Party Congress and subsequent CPSU Central Committee Plenums. Laborers of all branches of the national economy have made a worthy contribution to actualizing party plans. In this republic, the rates of growth have increased appreciably and the indicators of economic efficiency have improved. The role of intensive factors in its development has been strengthened. Whereas 80 percent of the increment in national income in the 10th Five-Year Plan was obtained through labor productivity growth, that figure exceeded 90 percent in this past five-year period. A trend towards decreasing materials-intensiveness of the social product has been noted.

The political and organizational work done to improve the economic activity of the labor collectives has ensured successful fulfillment of the five-year

plan assignments in industry. Substantial advances have taken place in the intensification of industrial production.

Republic industry did not attain the labor productivity growth rates outlined in the 10th Five-Year Plan. In view of the urgency of the problem of improving this key indicator of intensification and effectiveness of the efficient use of labor resources, the Lithuanian Communist Party Central Committee acknowledged the necessity of developing, to ensure its systematic resolution, a target comprehensive problem of industrial production intensification for 1981-1985, including a system of technical, organizational and socioeconomic measures.

As a result of its implementation, the labor productivity growth assignments for republic industry were successfully met. In the 11th Five-Year Plan, this indicator was increased by 19.5 percent, instead of the 16.6 percent under the five-year plan. Nearly half of all enterprises and associations obtained their entire production volume increment without increasing the number of workers. Assignments were also overfulfilled in terms of industrial production growth: calculations show that the overall industrial output volume will have increased by 25 percent over the five-year period, as against the 22 percent planned.

However, it would be incorrect to assume that the available experience and the results achieved fully meet modern demands. We still have definite reserves for further increasing labor productivity and further raising the level of intensification of industrial production. One such reserve is to eliminate in the national economy, and in industry in particular, low-productivity and physically difficult manual labor. At present, the proportion of workers employed at manual labor is 31 percent of the total employed at republic enterprises.

The efficient use of labor resources and reducing expenditures of manual labor by mechanizing and automating production processes become economically increasingly necessary with each passing year. In connection with the complicated demographic situation and the limited opportunities for enlisting additional manpower resources in social production, the increase in industrial production volume must be provided practically in full by increased labor productivity.

On the other hand, the social aspect of this problem is equally important. When manual labor is replaced by mechanized labor, human labor becomes not only more productive, but also more substantive, interesting and creative. This is especially important when young people whose educational and cultural level is quite high will be the main source for replenishing the workforce. For young people, manual, physically difficult, uninteresting labor is unattractive, resulting in a constant shortage of workers in certain occupations at enterprises of a number of branches of industry.

Reducing expenditures of manual labor is a complex problem. It requires planned implementation of technical, organizational, economic and social measures at all levels and in all links of the national economy and active, purposeful work by the party organizations.

Party, soviet and economic agencies have been and are attaching important significance to questions of mechanizing individual processes, automating production, and reducing manual and physically difficult labor. Back in April 1977,

the Lithuanian Communist Party Central Committee and republic Council of Ministers adopted a joint decree "On Steps to Accelerate the Introduction of Progressive Technology, Production Mechanization and Automation and Reducing Manual Labor in the 10th Five-Year Plan," in which specific assignments on reducing the number of workers employed at manual labor were established for the ministries and departments, associations and enterprises, for the first time. However, this work had to be given broader scope, and most importantly, a planned purposefulness.

Particular attention has been paid in the five-year plan just past to accelerating the rates of production mechanization, to the more effective use of labor resources, and to strengthening the creative character of labor. These questions have been reviewed repeatedly in the Lithuanian Communist Party Central Committee. Concrete steps have been taken to accelerate scientific-technical progress, to increase the effectiveness of scientific research, to limit the numbers of workers at enterprises, to accelerate the introduction of robot equipment and progressive technology, and a number of others. The attention of the party organizations constantly accentuates and the efforts of economic leaders, scientists and specialists are targeted on resolving them.

Mobilizing labor collectives to seek out reserves for reducing expenditures of manual labor has become an inseparable part of the organizing activity of the republic party organization.

This question was examined in detail by the Lithuanian Communist Party Central Committee Buro in June 1981. The decree adopted, "On Steps to Ensure Continuing Labor Productivity Growth in Lithuanian SSR Industry In Light of the Demands of the 26th CPSU Congress," determined the immediate concrete frontier of reducing the number of workers performing production operations manually by 11,300 in the 11th Five-Year Plan. The compilation of job descriptions [pasportizatsiya], done at the enterprises to carry out this task, has provided a good basis for objectively evaluating the level of production mechanization and has ensured that organizational-technical measures have been developed and carried out in conformity with the plan.

The comprehensive programs for intensifying industrial production and reducing the use of manual labor in loading-unloading, lift-transport and warehousing jobs in industry, transport and trade in the Lithuanian SSR in 1981-1985 which were worked out in the initiative of the Lithuanian Communist Party Central Committee have been a qualitatively new stage in solving this problem. The programs outline concrete targets for 15 industrial ministries and departments and 54 union-subordination associations and enterprises. The assignments for reducing manual labor and the measures in the comprehensive programs are included in the annual economic and social development plans, thus creating resources support for carrying them out.

Similar programs have been developed for each ministry, department, association and enterprise. The appropriateness of developing comprehensive programs on a regional scale has been verified.

In this connection, I should like to note the positive experience of the Alitus city party organization. The party gorkom has done much organizational and

political work aimed at increasing the role of intensive factors in developing industrial production. A comprehensive, systems approach to resolving the tasks ahead has become a characteristic feature of its work. Comprehensive programs for intensifying industrial production and reducing the use of manual labor at enterprises in the 11th Five-Year Plan have been developed and are being successfully carried out in the city with the participation of the party and economic aktiv and scientists and specialists from the Lithuanian SSR Gosplan's Scientific Research Institute of National Economic Planning and Economics. The production intensification assignments were based on concrete measures for each year of the five-year plan and were communicated to each worker collective, each shop and each production sector.

The party gorkom, economic leaders and primary party organizations are constantly concerned about increasing the city's industrial potential. The amount of capital investment being directed into retooling enterprises has increased 1.5-fold as compared with 1981 and the renewal coefficient for the active portion of the fixed production assets has increased nearly two-fold. The scope of introduction of progressive equipment and technology has broadened.

The purposeful work of the Alitus party gorkom has facilitated the more dynamic development of city industry. The rates of growth in production volume and labor productivity have significantly exceeded the five-year plan assignments.

The Lithuanian Communist Party Central Committee has approved the experience of the Alitus city party organization involving the development of territorial-branch comprehensive programs and has recommended broader use of the target-program method for intensifying production in other cities and industrial centers of the republic.

It is important not only to make a decision, but also to carry it out successfully. The Lithuanian Communist Party Central Committee and the party gorkoms and raykoms have undertaken to closely monitor implementation of the steps planned to reduce the sphere and expenditures of manual labor. On instructions from the Central Committee, the Gosplan, the republic People's Control Committee and the State Committee for Labor and Social Problems annually study the local efforts by the ministries, departments, associations and enterprises along this line. The check results and the reports by economic leaders and party committees are discussed in the industrial departments of the Central Committee.

Thus, the Industry Department has reviewed the activity of enterprises of the Ministry of Machinebuilding for Light and Food Industry and Household Appliances involving reducing the use of manual labor as outlined in corresponding decrees by the Lithuanian Communist Party Central Committee and the republic Council of Ministers. After the discussion, the enterprise leaders and party committees took steps to eliminate the shortcomings and errors noted and put their organization of this work in order.

As a result of much painstaking work done continuously and purposefully by the Lithuanian Communist Party Central Committee and the city and rayon party committees to actualize all the program measures, the frontiers outlined in the 11th Five-Year Plan have basically been reached, and some have even succeeded in advancing further than was planned.

We have successfully retooled and renovated production and improved technological processes, thanks to the active work by party organizations and economic agencies on accelerating scientific-technical progress and introducing the achievements of science and leading practice. Whereas 40 percent of state capital investment was directed towards these goals in the 10th Five-Year Plan, that figure is 55 percent in the current five-year plan. In recent years, republic industry has comprehensively mechanized and automated 370 shops and sectors, introduced 730 mechanized flow lines and automatic lines, installed nearly 6,000 pieces of highly productive equipment and mastered more than 4,000 progressive technological processes.

Modern production increasingly poses the task of not simply providing production with more-productive new equipment, but of developing and utilizing mechanisms which will carry out the basic production process and leave to people only the functions of monitoring and management. Such mechanisms include, in particular, industrial robots and manipulators. They are opening up broad opportunities for increasing the productivity of basic and auxiliary equipment, increasing the shift index, reducing defects and increasing production efficiency.

In conformity with the CPSU Central Committee and USSR Council of Ministers decree "On Increasing the Production and Introduction Into the National Economy of Automatic Manipulators With Programmed Control (Industrial Robots) in 1981-1985," a meeting of the republic Communist Party Central Committee Byuro has examined the question of the role of party, soviet and economic agencies, enterprises and planning organizations, in resolving these tasks.

The newness of the problem, its scope and interbranch character, have required specific organization, monitoring and management of work within the republic framework. These functions were entrusted to the Gosplan and to the "Litstankoproyekt" scientific-production association.

As a result of the measures carried out, the rates of production robotization have increased sharply in recent years. At present, nearly 600 facilities have been robotized at leading industrial enterprises. The number of pieces of robot equipment in use has increased nearly two-fold as compared with 1983. They have found broad application in the production of television picture tubes, computers, radio measuring equipment, and in the processing of plastics, in metalworking, in electroplating and in transport operations.

We view the task of reducing manual labor not only from the viewpoint of achieving the greatest production efficiency and greatest improvement in quality indicators, but also from the position of concern for people, for protecting their health and creating good working conditions.

The summary result of our efforts has been that the five-year assignment on reducing the use of manual labor has been met in four years. Nearly 11,500 workers have been transferred from manual to mechanized labor in industry, which is 2.5 times more than in the preceding five-year plan. Working conditions have been significantly improved for 100,000 workers, half of which were women. The level of labor mechanization has risen to 55.2 percent.

By altering the character and content of labor and by reducing fatigue, the provision of enterprises with modern equipment and the mechanization and automation of production processes have created conditions for shaping stable collectives and have facilitated strengthening labor discipline.

Many republic associations and enterprises have accumulated positive work experience in accelerating the rates of reduction in the use of manual labor on a basis of mechanizing and automating production. The main think noticeable in the experience of the leading collectives is a comprehensive approach to resolving this important socioeconomic task, an approach including careful analysis and recording of manual labor, and the development and implementation of measures aimed at reducing it simultaneously in both basic and auxiliary production. One characteristic example of such an approach is the mechanization and automation of production processes at the Vilnius Plastic Products Plant. In creative cooperation with the "Plastik" NPO and the "Plastpolimer" NPO in Okhtinskiy, it has designed and manufactured, on its own, equipment and devices permitting fundamental change in technological processes which has eliminated or significantly reduced the use of manual labor in receiving, preparing and distributing raw material, in loading and transporting finished output.

The combining of individual stages of job performance, especially when testing and manufacturing new equipment, in combination with setting up creative brigades of workers and engineering-technical personnel, permitted reducing the time involved in introducing scientific-technical innovations by a minimum of three to four years. As a result, the plan collective, with the effective participation of the party organization, was able to create highly productive, automated, waste-free plastics processing using robot equipment for the first time domestically, and comparatively quickly. In this regard, the outstanding work by a group headed by the plant director, Comrade A. Grishkyavichyus, was rewarded with the USSR State Prize in the Field of Science and Technology for 1984.

Much work is being done as well at the Order of Labor Red Banner "Ekranas" plant in Panevezhis. On the initiative of communists, the enterprise has developed and is successfully implementing a target comprehensive program for mechanizing and automating production processes. Progress in carrying it out has been repeatedly discussed at party meetings, in the party committee and in the shop party organizations. In order to accelerate the introduction of new equipment into production, engineering-technical personnel and leading production workers have been formed into 21 creative brigades, and socialist competition has been set up among inventors and efficiency experts. Communist engineers have been formed into a special structural subdivision concerned with developing and introducing industrial robots and manipulators. Cooperation with scientific organizations has been significantly expanded. Other production reserves have also been brought into play.

A tremendous amount of production retooling has been done this five-year plan at the plant thanks to their persistence in carrying out everything planned. More than 200 measures involving the mechanization of basic and auxiliary processes and transport operations have been carried out, 68 progressive technological processes have been introduced, and nine automatic and 30 fully mechanized lines have been put into operation. Plant shops operate 15 large technological

complexes equipped with 96 robots and manipulators. In view of the results achieved and experience accumulated here, this plant has been designated the lead branch plant for robotizing television picture tube production.

The continuous orientation of the collective towards raising the technical level of production has permitted freeing 224 workers from manual, difficult or monotonous operations and transferring them to jobs requiring more skill. Significant changes have occurred in labor organization; production standards have been raised. During the 11th Five-Year Plan, production volume has been increased, with 85 percent of the increment being provided by labor productivity growth.

A comprehensive approach to mechanizing and automating production processes is characteristic of the Vilnius Drill Plant. Production is being improved technically here in a manner which encompasses all technological processes. Highly skilled specialists are responsible for each sector. Their reports on the work being done are discussed at meetings of the enterprise party committee. Plant designers, technologists and machinists are striving to have the work done by mechanisms and various accessories throughout the chain, right down to releasing the finished product. Specialists and leading production workers have developed and manufactured 54 unique highly productive machine tools and automatic machines, six automatic lines and a number of other pieces of automation equipment over the last four years. Their introduction has permitted raising the level of labor mechanization and automation to 88.5 percent, including an increase to 96.2 percent in basic production. Since the start of the current five-year plan, labor productivity in the collective has been increased by 30.4 percent. Three-fourths of the increment was obtained through production re-tooling.

The scientific-technical community, the republic council and branch organizations for scientific labor organization, and the VOIR [All-Union Society of Inventors and Efficiency Experts] councils have participated actively in implementing production process mechanization and automation measures. Their activities have been of considerable assistance to enterprises and organizations and have involved studying and disseminating leading experience.

The conferences, meetings, seminars, schools and exhibits have been the most effective lines of activity for them. Contests and reviews are held to stimulate work on developing the creative activeness of the workers; they have organized creative business trips and meetings with scientists and specialists. Since 1983, the republic NTO [scientific labor organization] council has held contests to achieve the best results in the area of reducing manual labor.

The best technical resolutions to come out of the contests were displayed at the republic's "Mechanization of Manual Labor - 85" exhibit." Their economic impact is considerable. For example, NTO members made upwards of 4,000 proposals during last year's review of food industry NTO organizations. Introduction of a portion of them would permit transferring more than 400 workers from manual to mechanized labor.

Each year, more than 15,000 efficiency proposals and dozens of inventions aimed at reducing manual labor expenditures are introduced at our enterprises. Since

1984, the results in reducing manual labor have been included among the republic socialist competition indicators for the ministries, departments, associations and enterprises for achieving the best indicators in invention and efficiency proposals.

We understand that the opportunities for technical creativity are not yet being fully used. The efficiency proposals adopted for introduction are not always actualized in practice fully or with the proper effectiveness. Party organizations, jointly with the scientific-technical community, are taking steps to eliminate the shortcomings and are doing everything necessary to involve the workers more broadly in technical creativity.

Quite a bit has been done in republic industry to eliminate manual labor and to use labor resources effectively. However, we must not maintain, when discussing republic party organization experience in solving this problem, that everything is going smoothly. We do have difficulties and shortcomings. First, there is still considerable actual manual labor, especially at enterprises of meat and dairy industry, forestry, fruit and vegetable growing, machinebuilding, metalworking, and several other branches. Second, in spite of some advances, the considerable gap between mechanizing the labor of workers employed at basic production and mechanizing that for auxiliary production remains. The reserves here are truly large, since the level of mechanization of auxiliary work in industry is nearly 1.5-fold lower than for basic jobs. This difference is even greater in individual ministries, associations and enterprises.

In this connection, we are focusing the attention of economic agencies on the problem of redistributing funds designated for further raising the technical level of production. The bulk of them are currently still being directed into basic production, with only an insignificant part being used to mechanize auxiliary jobs. At the same time, experience at the leading enterprises demonstrates that, from the viewpoint of freeing manpower, capital investments in auxiliary production are much more effective than those in basic production, in a majority of instances.

On the other hand, the fact that enterprise requirements for many types of lift-transport, loading-unloading and warehousing equipment are by no means fully satisfied is a factor in the formation of the disproportions indicated above.

And there is another problem. Raising the technical level of production leads to an increase in the availability of capital to labor. But this is not always accompanied by a savings in labor resources. Balancing fixed production assets against labor resources dynamics and availability is therefore now one of our top-priority tasks. Its importance is emphasized in the CPSU Central Committee decree "On the Work Experience of the Collective of the Dnepropetrovsk Combine Plant imeni K. Ye. Voroshilov on Increasing the Effectiveness of Production Capacities Use On A Basis of Certifying Jobs and Improving Their Efficiency."

The experience of the Dnepropetrovsk combine builders is now being widely used in republic labor collectives. The Lithuanian Communist Party Central Committee, the Council of Ministers and the Lithuanian Republic Trade Unions Council have obligated the ministries and departments, associations and enterprises, to make a careful analysis of jobs in 1984 and to begin systematically certifying them

in 1985, developing and implementing measures to raise their organizational-technical level.

Questions involving organizing and conducting the certification were discussed at a republic seminar of economic leaders and party committee secretaries. The appropriate methods instructions and recommendations were communicated to the ministries, departments, associations and enterprises.

A recent check showed that the work done in this direction on the initiative of the Lithuanian Communist Party Central Committee was done in an organized manner. It has been done at the enterprises by certification commissions comprised of specialists, party committee and byuro members, and leading production workers. The availability [of machinery] to labor, the qualitative level of the equipment and technology being used, and the organizational characteristics of the workplace were determined in the course of the certification. One innovative principle of the certification was that the jobs were evaluated comprehensively, on the basis of technical, technological, organizational, economic and social factors. This, in turn, serves as a basis for taking steps to improve the jobs or eliminate those which cannot expediently be made more efficient.

Some experience in this area is already available at republic industrial enterprises. Thus, the "Vilnius Fuel Equipment Plant imeni 50th Anniversary of the USSR" PO has eliminated more than 100 inefficient jobs, modernized an equal number, and sold 63 pieces of surplus technological equipment over the last three years due to certification measures. The number of personnel employed at manual labor has been cut by 165 as a result. Moreover, job certification in the association has helped increase organization, combining occupations, expanding multiple machine-tool servicing zones, and increasing the equipment operation shift index. Questions of improving jobs and reducing manual labor are constantly the center of party organization attention here. The collective has been kept aware of the work being done, and the problems which have arisen have been discussed in a business-like manner at party meetings and in the shop party organizations.

What has been done at our enterprises in this area is only a start. Much more remains to be done to ensure that each job corresponds to the technically, organizationally and socially most progressive demands.

The republic is currently completing development of a comprehensive program for reducing manual labor for the period up to 2000.

One outstanding feature of the program will be the fact that it is being developed for a longer period, that it covers all branches of the national economy and that it is based on the results of careful job descriptions and certification for manual labor. Implementation of the program will permit a reduction in the number of workers employed at manual labor by more than one-third and the elimination of difficult physical labor in the 12th Five-Year Plan, just ahead.

Our present stage of development makes increased demands on people, the main productive force, stressing a thoroughly creative foundation to their activity, the creation of conditions for highly productive labor, for comprehensive development of their abilities and of their labor and social activeness. The

activity of the republic party organization involving reducing expenditures of manual labor and making better use of labor resources will serve as an effective lever for increasing the effectiveness of social production and resolving pressing tasks of intensifying the economy.

The laborers of Soviet Lithuania will doubtless greet the 27th Congress of the Communist Party of the Soviet Union with new labor successes.

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RAISING EFFECTIVENESS OF TECHNOLOGY IN FORGING, FORMING INDUSTRY

Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: MASHINOSTROYENIYE in Russian
No 2, Feb 86 pp 8-14

[Article by Prof. A. G. Ovchinnikov, doctor of technical sciences]

[Excerpts]The intensive development of mechanical engineering, envisioned by the project of the Basic Guidelines of Economic and Social Development of the USSR for 1986-1990 and the term up to the year 2000, depends to a large extent on progress in the metal-working and billetting industries in general, and the forging-forming industry in particular.

The technology of the forging-forming industry provides an improvement in the mechanical characteristics of the machined parts and increased coefficient of utilization of metal (KIM) in the process of plastic deformation, higher productivity and lower labor costs during the subsequent machining by cutting, which may also be regarded as an increase in productivity.

The technology of the forging-forming industry is a low-waste technology, as it is based on processes of plastic deformation, and is capable of boosting the KIM to 0.96. We may be confident that further increase in the specific share of forging-forming technology in metal-working and its subsequent development will assist in the solving of the important task posed by the project of the Basic Guidelines: increasing the labor productivity by 23-25 percent. Thus, e.g., the labor intensity of the processes of cutting and cold extrusion forging, as determined by the number of machines and the production space in conditions of identical automation, is estimated at a ratio of 4:1. Conversion of fastening parts alone to cold extrusion forging will allow a reduction of the metal outlay from 2.3 to 1.5 million tons in our country [1].

In the solving of the tasks of further increase in the effectiveness of the technology of mechanical engineering and acceleration of the scientific-technical progress, an important part is assigned to the use of the scientific-teaching potential of advanced education. This applies equally to the training of highly-qualified engineering staff of a broad profile with knowledge of the fundamental sciences and ability to employ it in practice, and to the future improvement and significant expansion of the scientific research and development and a sharp increase in their economic return. The basic task is

to strengthen the bond between science and industry and to create new organizational forms of integration of science, technology and industry to allow a quick and efficient movement of scientific ideas from their genesis to a widespread practical adoption.

In the past 5 year period, department AM-6 of the MVTU [Moscow Advanced Technical College] imeni Bauman has carried out studies aimed at improving the existing and developing new technological processes and forging-forming equipment.

The studies posed the questions of developing mechanical layouts for plastic deformation of a billet in processes of working by pressure to afford the most uniform distribution of stresses. Such technique allows a sizable change in shape with a single pass and requires less application of external force. In other situations, schemes of deformation and selection of the appropriate billets to afford maximum reduction in metal outlay were analyzed. Such problems were solved by the methods of the theory of metal-working by pressure: the method of solving the approximate equilibrium equations with use of the plasticity equation of state, the method of the upper estimate, the slip line method and others. The result was a solution of problems concerning the analysis of the technologies of die forging and plate forming in conditions of cold and hot plastic deformation as applied to billets of compact and powder (porous) materials.

On the basis of these solutions, the technological processes, a procedure of calculating the technological parameters and die designs were developed for extrusion forming with active involvement of frictional forces for a variety of parts: cylindrical and rectangular. These parts are cups with steplike inner cavity or steplike outer surface. The possibility of cold extrusion of cups with a height comprising 2.5-3.0 diameters has been demonstrated.

The technological processes and dies have been developed for cold extrusion of boxlike parts of aluminum alloy, enabling uniform shaping of the walls [5, 10,11,12]. Layouts have been developed for deformation in conditions of cold deformation during the forming of parts from powder materials with subsequent baking. The use of powder materials enables the manufacture of parts with homogeneous distribution of the mechanical characteristics. Cold pressing in closed molds with creation of mechanical schemes affording shear deformations in addition to hydrostatic compression enables the manufacture of high-density parts with correspondingly higher mechanical strength characteristics [5,11,12]. These technological processes are most effective when using special equipment: hydraulic presses designed by the department [11]. At present, three special hydraulic presses with force of 4.0 MN have already been built and will be introduced into production in the first year of the 12th Five Year Period.

It is possible to carry out cold extrusion forming with application of extremely high specific deformation forces (up to 2500 MPa), corresponding to the level of strength characteristics of tool steels. It is therefore highly important to develop reliable methods of design, guaranteeing a high stability of the

working parts of the dies (primarily, the punches and band dies). Such a procedure has been worked out [10].

The traditional technology of manufacture of screw taps from R18 steel involves extremely large waste of scarce materials. The department has developed thermo-mechanical forming regimes (temperature range and deformation speed) enabling a more than twofold reduction in metal outlay. For this, hydrodynamic extrusion is employed with a hydraulic impulse hammer-press lacking an anvil block [2]. In the production of forgings of complicated shape in open dies, in order to create conditions for filling the cavity of the die with metal a considerable portion of the latter must be extruded into the fin. In certain cases, the volume of the fin is as much as 40 percent of the forging. A savings of metal may be achieved when the shape of the billet is close to the shape of the forging. In this case, the cavity of the die may be filled by upsetting. The flow of metal into the fin may be lowered to 5-10 percent of the volume of the forging. The billet may be produced by the technology of the casting industry. Thus, an integrated casting and forging process permits the development of a low-waste technology. However, a certain degree of deformation of the billet during the forging is necessary to assure high mechanical characteristics of the workpiece. Such investigations have been carried out together with our colleagues of the Magdeburg Technical College. The technological process has been worked out and an automatic casting-forging machine has been proposed [13].

Closed-die forging enables a 15-35 percent reduction in metal outlay. The use of this forging method has enabled the development of a technology of production of intricate parts in sectional dies [9].

In choosing the force of a hot-forming crankpress (KGShP), it is necessary to allow for the spread due to instability of temperature and volume of the billets, in addition to the average nominal force of the forging process. It has been established that induction heating is the preferred method of enhancing the precision of the forgings. This allows a control of the heating temperature of the billets with an accuracy of $\pm 25^\circ\text{C}$ in the process of forging with automated complexes [3].

Integration of the technological processes of welding and forging also allows a development of low-waste technological processes [6]. In this case, a strip of metal is cut out of a sheet, bent and welded. The result is a cylindrical billet, which is then formed in a conical die. Such technology is practically a no-waste technology. If we use the traditional technological process with sheet drawing, the wastes will be significantly more than the mass of the finished article. The technology developed at the department has been used to form the friction disks of the tractor K-700.

The processes of rotation extrusion have a number of advantages. Their use does not require high-power forging equipment or complicated dies. Moreover, the presence of a sole local site of plastic deformation allows the manufacture of thin-wall shells of complicated shape without the use of intermediate annealing. An investigation of this process at the department established a number of laws, developed a procedure of calculating the technological parameters, and identified the design features of the tools and dies [15].

The department has developed equipment and tools for the forming of parts from plastic in detail molds [7]. Such automated line is the prototype of a modern flexible manufacturing system.

In the development of new types of forging-forming equipment, attention is paid to the creation of the mathematical models providing rigorous and exhaustive information within the context of the original assumptions. This enables the solution of problems of design optimization relative to a particular criterion and improved quality of the design process. Such investigations are being carried out for crankpresses [13]. The department has always devoted much attention to the creation of new types of heavy-duty forging-forming equipment. The question of energy consumption would be given special attention in this process. In cooperation with designers of the Tyazhmekhpress VPO [production association], a design has been developed for a high-power screw press for the forging of turbine blades, crankshafts and similar parts from difficult-deforming metals and alloys with increased precision [4].

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Analysis of technological processes occurring in two or more flow channels lets us find the rates of metal flow for the formation of the wall of a cup and an interior protrusion. If we know the rates of flow, it is possible to select the geometrical relationships by computation in each particular case (without experimental investigations) for the fabrication of cups with given dimensional parameters or to select a technological process enabling an extrusion forming with application of allowable specific forces (given the strength characteristics of the punch).

The development of such calculation procedure will speed up the technological preparation of production.

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INDUSTRY PLANNING AND ECONOMICS

SOVIET-BULGARIAN JOINT VENTURE TO COPRODUCE MACHINE TOOLS

Moscow IZVESTIYA in Russian 18 Mar 86 p 5

[Article by Izvestiya correspondent V. P. Zakharko: "The Science of Working Together", under the rubric SEV: ACHIEVEMENTS AND FUTURE PROSPECTS; capitalized passages published in boldface]

[Text] SOFIYA--THE 18TH OF MARCH MARKS THE 38TH ANNIVERSARY OF THE SIGNING OF THE SOVIET-BULGARIAN TREATY OF FRIENDSHIP, COOPERATION AND MUTUAL ASSISTANCE. FORCEFULNESS, INDUSTRIOUSNESS AND INITIATIVE ARE TRAITS BECOMING EVER MORE COMMON IN THE MULTIFACETED RELATIONS BETWEEN THE TWO COUNTRIES. IN THE ECONOMIC FIELD, THERE IS AN INCREASING TRANSITION TO NEW FORMS OF SOCIALIST INTEGRATION AND EXPANDING TIES BETWEEN PRODUCTION AND RESEARCH GROUPS. AMONG THE PROMISING FORMS OF COLLABORATION ARE JOINT SCIENTIFIC PRODUCTION ASSOCIATIONS.

"On Wednesday I was told to catch a plane from Sofiya on Saturday and report to work at Ivanovo no later than Monday morning. And I was not to be alone, but at the head of a group of 19 specialists."

"Did you make it?" I asked Krum Konyarsky, winner of the country's highest Dimitrov prize and director of one of the design departments of the machine tool production association ZMM of Sofiya.

"It doesn't take long to pack your suitcase! But I wasn't sure everyone would be able to carry out the formalities usually involved in a foreign business trip within this deadline. As it turns out, there are fewer formalities for trips to the USSR by the workers of the ZMM, who have created a joint enterprise with the Ivanovo Machine Tool Production Association."

Everyone I talked to about the joint NPO stressed how important it was to organize direct and expeditious contacts between the partners, with no delay in solving present and future problems. A good example has been set at the top: the intergovernmental agreement for formation of the NPO was prepared in the shortest time and instantly signed. V. P. Kabaidze, director general of the Ivanovo association who has recently spent some time at the ZMM, says the following on this subject:

"Previously, those involved in writing such document would have taken pains to detail everything, using a mass of figures, graphs and tables. If we had tried to formulate every possible case in the present situation, three years would

not have sufficed. And you can't make up for lost time. Today, a different method has been chosen: to conclude an agreement in principle, to immediately start the two sides moving together, and to let them handle all the problems arising during the course of the project. And this produces results. The international NPO has been in existence since 1 January of the present year, and its first machines are already being built."

Settling into an Ivanovo hotel on Monday morning, Konyarsky and his entire group immediately set out for the enterprise. After introductions, they were assigned to rooms: hydraulic technicians with hydraulic technicians, mechanics with mechanics, electricians with electricians. And the work began: every day, from morning till evening, the same as everyone else at Ivanovo.

This work did not resemble what the newspapers and television have often described: foundry workers, miners, combine workers, lathe operators and construction workers traveling hundreds and thousands of kilometers to hold down a position for one or two days and demonstrate their skill. Such method of exchanging experience directly at the work site obviously had its uses. But today, when each of the socialist countries has many of its own first-rate workers and specialists, business trips must have a new and more far-reaching goal. The Ivanovo and Sofiya engineers collaborated in the same project, reducing their designs and alternatives to a common denominator. They filled in the features of a future machine tool before beginning its production at the Bulgarian factories.

Konyarsky showed me a diary which he kept during the entire month of work at Ivanovo. He showed me the days and the hours. The work already done and freshly entered on the blueprints is underlined, along with what remains to be calculated, checked and coordinated. Although much is similar, the labor organization, the standards for compilation and approval of technical documents, and the metal-working precision coefficients are by no means identical in the USSR and the NRB. Several of the standards are different, especially those for industrial noise and safety methods.

"Once an amusing situation occurred" says my interlocutor with a smile. "Usually, when the specialists of the two countries officially discuss a problem, as a rule they sit on opposite sides of the table. My group also included engineers from the Elprom electrotechnical association, which was providing a number of the machine units. It had become necessary to coordinate certain matters on the spot at Ivanovo. Naturally, everyone began to sit down according to "national affiliation". But all at once we realized it was not that kind of situation, that we were not representing the interests of two countries, but of two companies: the joint NPO and Elprom. Let me say that quite a bit of unflattering, but valid comments were made to Elprom, but there was reason for it. Having formed a joint association, we are getting used to our new rights and responsibilities and learning to conduct a joint policy toward a common goal: from the design stage to the production stage."

A correspondent of the newspaper Otechestven front asked V. P. Kabaidze, who had previously been at the ZMM factories in several cities of Bulgaria: "In your opinion, are the Bulgarians now ready to keep pace with Ivanovo and their basic rule of producing a new type of machine tool every year?"

"No, they are not ready. But that is today. However, if we adopt and maintain an efficient businesslike attitude, if all problems are hammered out by the tried and proven method of hard work, then the ZMM will achieve its goals and keep pace with us. My comrades and I believe in this. We have been here before, we know the potential of the people and the industry. Without trust, you cannot work with a partner. Without trust, the joint enterprise would not have been formed."

While the basic issues of the cooperation were being worked out, preparations were begun at the factories in five cities of Bulgaria to produce parts and assemblies for the Ivanovo model IR-200 machining center! An unusually high pace has been set. A very rigorous quality inspection has been established. It is expected that, by early April, at the time of the 13th Congress of the Bulgarian Communist Party at Pazardzhik, the first of these units will be assembled.

Next in line is the IS-500 (the letters stand for Ivanovo-Sofiya), a new generation of machining center, with fewer parts but higher speed and machining precision, with new technological capabilities, able to operate within a flexible manufacturing system. By the end of the year, 20 such machines are scheduled for assembly, 10 each for Bulgaria and the Soviet Union.

"Today", says Konyarsky, "we are drawing the first circle of our collaboration--from the blueprint to the finished product. Gradually, but by no means slowly, this circle will expand, taking in all the new aspects of activities under a unified production and financial-commercial policy. The scientific research, planning and design, management, production of the machines, sales in both countries and on the world market, and service will be carried out jointly. And the machines will number in the thousands. Many thousands."

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INDUSTRY PLANNING AND ECONOMICS

OFFICIAL DISCUSSES RE-EQUIPMENT OF UZBEK MACHINE INDUSTRY

Tashkent EKONOMIKA I ZHIZN in Russian No 1, Jan 86 pp 28-31

[Interview with Mikhail Andreyevich Kandaurov, director of the department of machine-building, Uzbek SSR Gosplan: "Industrial Economic Problems: Accelerating Scientific and Technical Progress - the Key Task: Machine-Building Today and Tomorrow"]

[Text] Without the re-equipment of all branches of industry, it is impossible to achieve a rapid improvement in our economy. Decisively important in this is the machine-building industry whose growth has been given top priority in the 12th 5-year period.

Re-equipment with modern technology is not the simple replacement of physically worn-out and obsolete machines with new ones but an attempt to reach a higher level of technology and to introduce robotics.

The reconstruction of existing factories is one of the more complex problems in re-equipment of our industry. The 1985/3 issue of our journal presented a roundtable discussion of experiences and problems in the reconstruction of industry but this did not include any representatives of building and construction organizations.

The editors conducted another roundtable discussion by correspondence and the participants were: the director of the department of machine-building, Uzbek SSR Gosplan, M.A. Kandaurov; director of the subdivision for interindustrial operations and the introduction of automatic manipulators and robots, Valentin, Alekseyevich Nikiforov; deputy minister of the Uzbek SSR Ministry of Special Construction, Akrem Ibragimovich Klebleyev; and the director of the Tashkent special office of the Soyuzmontazhlegmash trust, Nikolay Nikolayevich Nikitin.

Here is what they said.

[Question] Mikhail Andreyevich, how has the machine-building industry in Uzbekistan grown over the past 5-year periods and what are its prospects for growth until 1990?

[Answer] Machine building is one of the most dynamic industries in our republic. It is growing at an average rate of 6-7 percent per year and is now turning out 2.5 billion rubles worth of production each year. The draft for the plan for the 12th 5-year period calls for still higher growth in this industry.

The Uzbek SSR Gosplan along with the union factories have discovered that it is possible by 1990 to achieve the following production growth rates with the 1985 figures being 100 percent: 136.6 percent in the Ministry of Agricultural Machinery; 137.5 percent in the Ministry of Light Industry, Agronomy and Consumer Appliance Machinery; 141 percent in the Ministry of Machine Building; 110 percent in the Ministry of Automotive Industries; 135.2 percent in the Ministry of Construction, Road and Communal Machinery; 158.8 percent in the Ministry of Heavy Machinery; 400 percent in the Minzhivmash [not further identified] and 161.5 percent in the other ministries.

[Question] This is an imposingly sharp increase. What is responsible for it?

[Answer] Ministries like the Ministry of Automotive Industry and Minzhivmash operate small plants within our republic that cannot be seriously strengthened by means of reconstruction. At this time, there are being opened an entire series of new and large plants furnished with modern equipment and new plants are supposed to be constructed during the 12th 5-year period which should provide an increase in production of between 400 and 1100 percent.

The demand for the production from plants in a few other ministries has dropped and we must find new demand or increase the present demand. For example, the Samarkand home refrigerator factory is not even operating at its present capacity because the quality level of its products was for a long time far below that of other domestic refrigerators. This factory is now being modernized and is installing a more reliable compressor, evaporator and an improved finish. Therefore, the demand for that factory's refrigerators has grown considerably.

For the time being, the low level of exploitation of production potential is manifesting itself in the mean figures for all industry.

Up to 1984, the Uzbekselmash factory produced three types of sowers at the rate of 9100 units per year and the production has not kept full pace with the demand. With the present production of only 8000 all-purpose and more reliable sowers (using Kedr electronic tracking devices), the demand by collective farms and state farms is fully satisfied. For many different reasons, the demand for cotton harvesters has dropped substantially and T28Kh4 tractors and this also shows itself in the average rates of increase.

For example, let us look at the republican Podemnik [Elevator] Production Association. There still exist no possibilities for expanding it. Its

products are in demand and it is fully meeting that demand. All that remains is for it to increase its export production and it is now working toward that end.

[Question] Does this mean that any increase in machine production depends on the building of new factories? What about the reconstruction of existing facilities?

[Answer] The opening of such large-scale machine-building plants such as the Pashkent motor factory, the 100,000-ton capacity casting foundry of the Tashkent tractor factory, a tractor trailer factory in Leninsk (Andizhan Oblast), bearings factory in Akhunbabayev, cable factory and electrical equipment factory in Dzhizak and other new plants have substantially influenced the growth of production in their various branches of industry. However, both the reconstruction and re-equipment of many plants is gaining pace, new technological processes are being introduced, new machines for cotton cultivation, the mechanization of fruit cultivation work in orchards and vineyards are going into series-production. Prospective designs for new road-construction and irrigation machinery for many electrical and electronic items have been created. All of this has already been produced or is being introduced to production as a result of reconstruction. Along with this, Uzbek machine builders are also receiving many complaints about the insufficient technical quality of tractors, cotton harvesters, dusters, sprayers and other types of equipment. We need to improve their quality, reliability and service life and reduce their metal content and energy consumption. All of these problems will be solved in the process of re-equipping our plants.

For the ministries and departments of the Uzbek republic and the union plants, Gosplan has prepared tasks for increasing the volume of production, reducing labor intensiveness and production costs, increasing the shift-use factors for equipment and reducing the number of workers performing manual labor. All of the machine-building plants are now working on comprehensive plans for technical re-equipment and the introduction of scientific and technical advancements.

The plans for technical re-equipment of factories reflect the problems of increasing production potential, equipping factories with progressive types of technological equipment such as NC machines, metal-working centers, robotic complexes and flexible production systems.

Much attention is being devoted to the broader introduction of plastics and polymers, the powdered metal manufacture of parts and strengthening the surfaces of welds by spray-coating them.

[Question] In recent years, there has been a perceptible shortage of machinery in agriculture. Will these shortages be eliminated in the next 5-year period?

[Answer] With regard to machine-building industries, the draft of the plan for the 12th 5-year period plan calls for the organization of production of

much more cotton-cultivating, harvesting and processing machinery than Uzbekistan needs. Some of this equipment will be sent to other republics and some exported. Such equipment includes wheeled tractors for cotton cultivation, tractor trailers, all-purpose cotton sowers, herbicide application gear, cotton cleaners, cotton harvesters, all-purpose cultivators, boll-harvesting machines, duster-sprayers, general cotton trucks etc.

[Question] In the last 5 years, we have very keenly felt the lag in the work of cotton-cleaning plants and the textiles industry. What changes in machine-building will be made for these industries in the coming years?

[Answer] Cotton-cleaning plants require considerable reconstruction and re-equipment. A large amount of this work will have to be done by Uzbekkhlopkomash which has to increase its output of equipment and spare parts from the 1985 level of 57 million rubles to 78 million in 1990. It will basically be producing both new and modernized equipment. For example, out of the 8 types of equipment used to pick cotton, store it and sort the bales, 5 will be new and three modernized while out of the 13 types used to clean cotton seeds, two new ones will be produced.

The technology used by the textiles industry will undergo some serious changes. The Uzbektekstilmash Production Association is increasing its output of equipment and spare parts from the 1985 level of 37 million rubles to 52.3 million. Eleven news types of machinery will be going into production.

At the end of the 12th 5-year period, special facilities will be created to produce cocoon-reeling equipment at the Kokandtekstilmash plant and the Shelk [silk] Central Technological Design Bureau is to put into production equipment for the mechanization of silk cultivation. For this it is necessary for the Uzbek Ministry of Agriculture to see that the experimental wing of the Shelk bureau be opened in 1985 and the production wing in 1987.

To provide practical assistance to the plants of Uzbek ministries in assimilating new equipment, technological processes and the complicated nomenclature of consumer goods, the Tekhnolog Science and Production Association annually does 500,000 rubles worth of work in the designing, manufacturing and introduction of equipment, accessories and tools. About 2.5 million rubles worth of the same type of work is also being done by other organizations.

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INDUSTRY PLANNING AND ECONOMICS

CURRENT PROBLEMS IN ORGANIZATION OF REPAIR WORK

Alma-Ata NORODNOYE KHOZYAYSTVO KAZAKHSTANA in Russian No 1, Jan 86 pp 14-17

[Article by O. Sabdenov, senior scientific colleague of the Institute of Economics, Kazakh SSR Academy of Sciences, candidate of economic sciences, laureat of the Lenin Prize of the Kazakhstan Komsomol]

[Abstract] The aging of industrial production equipment has multiplied the costs of repair work. The repair of aging equipment in 1984 consumed enormous resources and one-fourth of our industrial production equipment was undergoing repair work. In the Kazakh SSR, the costs of major overhaul of industrial equipment has more than tripled over the last 15 years and much of it is over 15-20 years old, therefore the high cost of repairing and maintaining it has greatly retarded the growth of Kazakh industry. The author proposes the establishment of a center for planning the retirement and overhaul of old machinery. This requires setting norms for the maximum service life of such equipment, establishing schedules for the required retirement of old machinery and monitoring the correct implementation of these plans. The chief means of increasing the efficiency of the repair and overhaul of industrial machinery is thorough specialization and centralization on an industrial, interindustrial, regional and inter-factory level. This can be done centralizing repair work in specialized associations and plants, provided a good supply of spare parts and components, seeing that repair personnel are well-equipped in the necessary gear and tools and using advanced forms of organization and control of repair work to extend the period between repairs. Increasing automation also requires new forms of organization of repair. Plants producing industrial equipment must also take a greater role in its repair, overhaul and certification. The proper parameters for equipment service life and aging must be established by all concerned personnel including designers, engineers and operators. Efficient repair and overhaul must be strictly planned at all levels of industry and this requires completely new systems of organization and technology.

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INDUSTRY PLANNING AND ECONOMICS

SELF-FINANCING AS METHOD OF EFFICIENT MANAGEMENT

Moscow VOPROSY EKONOMIKI in Russian No 1, Jan 86 pp 25-34

[Article by V. Moskalenko, deputy general director for economic problems of the Sumy Machine-Building Science and Production Association]

[Abstract] The Sumy Machine-Building Science and Production Association is experimenting with self-financing as a means of improving worker productivity and achieving higher efficiency and profits. The mechanism of self-financing consists of the elements of assessing work results, planning, worker payment and stimulation, financing and credit activity and setting prices. Self-financing requires greater use of own and borrowed funds, greater independence and more responsibility for results. There is less reliance on central or ministry funds for investment purposes as the plant's profits are managed and organized into various funds for the introduction of new technology, worker stimulation, construction and reinvestment. The main features of the association's experiment in self-financing were the financing of investments, new technology and construction exclusively through the use of own and borrowed funds including profits, depreciation deductions and long-term bank credits, assessment of company activities on the basis of its generated profit, reliance on various economic levers to stimulate production and efficiency, creation of worker-incentive funds and establishing agreed-upon standards for increments to production. Full cost and profit accounting had positive results and over a period of 11 months, the association was able to achieve all of its planned indicators and increase its income by one-third. 2 tables, no references.

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INDUSTRY PLANNING AND ECONOMICS

CREATION OF HIGH-EFFICIENCY EQUIPMENT

Moscow VOPROSY EKONOMIKI in Russian No 1, Jan 86 pp 35-43

[Article by A. Orlov]

[Abstract] Technical innovation, new inventions and new patents are appearing at a rate higher than they can be assimilated by the economy, especially in the USSR. The creation and assimilation of a new item of technology similar to an existing one takes about 3-5 years while the creation and twice as much time is required for completely new technology. It is therefore necessary to develop a strictly differentiated approach to planning, developing and stimulating technical innovation. A greater priority must be given to the developing systems of economic incentives that encourage engineers and industries to develop completely new technologies because under the present conditions the emphasis is too much on finding short-term solutions that produce more immediate results. In 1986-1990, more emphasis will be placed on encouraging designers and engineers to work more creatively at achieving technical progress. More attention must also be given to training and increasing the earnings of the greatest possible number of highly-qualified specialists capable of highly-inventive work to solve problems in the creation of unique and completely-new equipment and technologies. The level of knowledge and experience within this specialized cadre has recently dropped and measures must be taken to remedy this situation. It has become necessary to plan, select and organize technological innovations and see that they are developed and assimilated according to a set schedule. The authors also feel that laws must be enacted to punish those responsible for any obstructions or delays in the assimilation of new technology. Good results have been achieved by the formation of temporary mobile groups of scientists, specialists, inventors and industry representatives to aid in the more rapid assimilation of new equipment. A key problem at this time is that there is a lack of full agreement between planning and the presently-used system of economic incentives. Incentives must be restructured to better suit the goals of economic planning.

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INDUSTRY PLANNING AND ECONOMICS

PROGRESS IN INTRODUCING FLEXIBLE PRODUCTION SYSTEMS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 25 Feb 86 p 2

[Article by I. Glebov, socialist labor hero, delegate to the 27th Congress of the CPSU]

[Abstract] The Intensification-90 program has already resulted in the creation and introduction of over 70 flexible production systems in the Leningrad region. Each of these systems was expensive but has also produced a savings of 4 rubles for every ruble invested in them. In the machine-tooling industry, automation has raised the shift-factor for equipment operation enough to increase production by 170 percent. Thirty-four introduced systems for computer-aided design and technological preparation of production have increased labor productivity by 200-250 percent and saved between 500,000 and 1,500,000 rubles per year. Many plants are working to create integrated production complexes in which electronic technology is applied to all stages of work from research and development of a new product through its technological preparation for production to production itself. Where we have done this work, we hoped that the introduction of computers, robots and flexible systems will lead to the discovery of newer technical, organizational and process-control ideas. The Elektrosila Production Association cooperated with the State Electrical Machinery Scientific Research Institute to create an experimental model of one of the world's first cryogenic turbine generators and is now testing a 300,000-kilowatt industrial model that utilizes superconductivity. Some computer centers have been consolidated into computer networks and this allows as many as 100 different establishments to use the same computer facilities, has freed 3,000 workers and produced an annual savings of 18 million rubles. Suggestions have been made to spare plants the job of making small lots of necessary parts, tools and blanks by setting up regional centers that can manufacture these items for many different plants. This and other progressive ideas have often met departmental and technological obstructions. The use of flexible production systems today is helping to overcome these barriers.

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INDUSTRY PLANNING AND ECONOMICS

BRIEFS

LAGGING MACHINE-BUILDING PLANT FINED--The Baku Machine-Building Factory imeni G.K. Petrov has broken its agreements and failed to supply organizations of Mingeo USSR with dozens of derricks and bases for its drilling installations. The factory has not fulfilled its planned production and supply for an entire year now. Gosarbitrash has just upheld the suit entered by the Moscow Special Office of Soyuzgeosnab and ordered the Baku plant to pay 70,767 rubles and 20 kopecks for the unsupplied equipment in the first and second quarters of last year. The firm must also pay an additional 10,000 rubles to the state budget as a penalty for poor discipline in the performance of contract obligations. When the case was reviewed, it was discovered that the plant had systematically failed to supply the required number of derricks and bases for years. For example, in the first and second quarters of 1985, the plant had failed to supply various geological prospecting organizations with a total of 28 derricks and 14 bases. Mingeo is now preparing its legal claims for the Baku plant's nonprovision of equipment during the third and fourth quarters of 1985. A difficult situation has been made even more so in organizations of Glavtyumengeologiya that are prospecting in inaccessible regions under harsh climatic conditions. The drilling at exploratory shafts has been interrupted and drilling machinery costing millions of rubles has been standing idle for months. These installations will remain idle as long as the Baku plant fails to provide them with the proper number of derricks and bases for which it charges 17,000 rubles. The Ministry of Chemical Machinery's Baku plant failed last year to provide a total of 44 drilling derricks and 19 bases. This has put the workers of Tyumen's oil-prospecting organizations in an extremely difficult situation which is becoming very critical. [By G. Alimov] [Text] [Moscow IZVESTIYA in Russian 11 Jan 86 p 2] 12261

PROGRESSIVE MACHINE-BUILDING PLANT--The deputy director of the chief technical office of the Ministry of Machine-Building Industry, V. Yefremov, has stated that the economic survey by V. Sukhachevsky has been reviewed in the Ministry of Machine-Building and Tool Industries. The ministry and the central committee of the machine-building industry trade union have approved a plan for measures to be taken to disseminate the working experiences of the Ivanovo Machine-Building Production Association, to accelerate the creation of

high-speed and marketable metal-working equipment and to introduce advanced technologies. On the decision of the ministry's expert council, plans have been made to introduce the Ivanovo plant's experiences on a large scale to 40 other plants in the industry. This will produce a savings of about 30 million rubles during the 12th 5-year period. To improve the use and increase the shift operation factor of equipment at ministry plants, a large-scale program has been set for the period up to 1990. Over this period, the operating shift factor for advanced equipment including NC machinery will be raised to 1.9. In order to widely introduce the work done by innovators, inventors and efficiency experts, the ministry has a working group of sub-ranch directors and the leading specialists of the chief scientific research institutes. The most recent meeting of this group examined the work of 15 innovators including the suggestions made by the machine operator B. Batrakhanov published in IZVESTIYA. The decision was made to determine the needs of the ministries of electronics industries, instruments, automobile industry, ship building, radio industry and other industries for the equipment designed by B. Batrakhanov in order to organize its series production. [Text] [Moscow IZVESTIYA in Russian 12 Mar 86 p 2] 12261

SOVIET-BULGARIAN MACHINE-BUILDING AGREEMENT--Sofia--Since signing an agreement with machine builders from the city of Ivanovo, the Sofia Metal-Cutting Machinery Science and Production Complex has become an integral part of a joint Soviet-Bulgarian undertaking. We spoke with the secretary of the party committee at the complex, Atanas Atanasovich. Here is what he said: "Although only a few months have passed since our governments signed the agreements to create two Soviet-Bulgarian machine-building science and production associations, the work has already begun. We understand that we do not have the time get ourselves rolling so we have already begun to retrain directors and specialists, have prepared a concrete plan of work for the joint undertaking and are looking at variants for cooperation between our party organizations within the framework of a united party committee. We are reorganizing everything as we go. M.S. Gorbachev's arrival in Sofia and speech to the workers of our plant in October 1985 made an unforgettable impression on us. His words about the need to more rapidly assimilate the achievements of scientific and technical progress and new approaches to solving our common problems greatly inspired those who heard his speech. As has already been announced, at the end of January 1985 there was established still another Soviet-Bulgarian enterprise for the joint production of automotive electronic systems and their components. A new form of integration was therefore given its start in life". [By PRAVDA correspondent L. Zhmyrev] [Text] [Moscow PRAVDA in Russian 24 Feb 86 p 6] 12261

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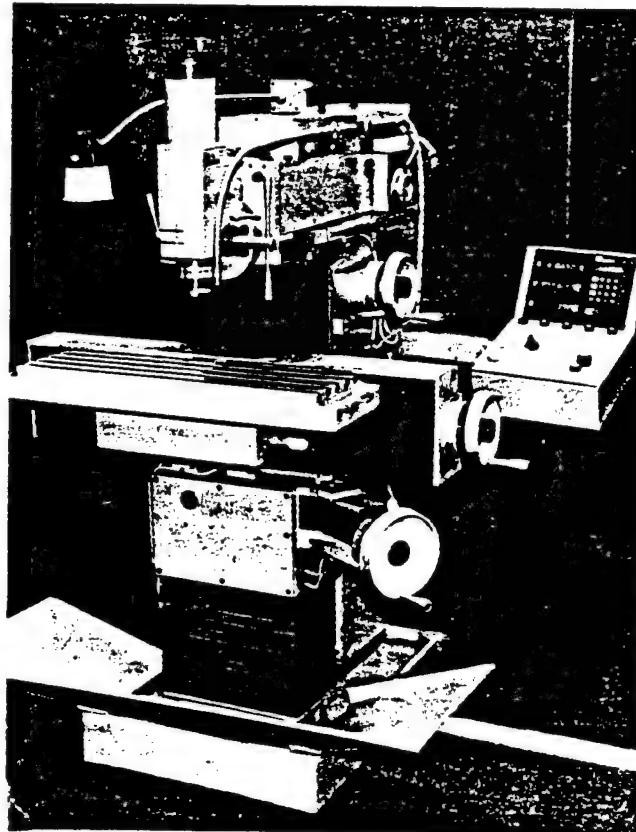
METAL-CUTTING AND METAL-FORMING MACHINE TOOLS

ERGONOMIC SUPPORT OF DEVELOPMENT, OPERATION OF EQUIPMENT

Moscow TEKHNICHESKAYA ESTETIKA in Russian No 1, Jan 86 p 10

[Article: "Ergonomic Support for the Creation and Operation of Engineering Equipment"]

[Text] Soviet production should embody the latest advances of scientific thought, should correspond to the highest technical and economic, esthetic and other consumer requirements and should be competitive on the world market (from the Draft CPSU Program, New Edition).



The SMK-25 universal milling machine was developed with the participation of ergonomists. The developers were the Vilnius Branch of VNIITE [All-Union Scientific Research Institute of Engineering Esthetics] and the Komunaras Plant. The saving from introduction is 95,000 rubles. The unit is exported to Japan, West Germany, Switzerland and Austria.

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CSO: 1823/140

AUTOMATED LINES AND AGGREGATED MACHINING SYSTEMS

INTRODUCTION OF FLEXIBLE AUTOMATED SYSTEMS

Minsk NARODNOYE KHOZYAYSTVO BELORUSSII in Russian No 12, Dec 85 pp 20-26

[Interview of Viktor Ivanovich Goryushkin, head of Chair of Machine-Building Technology, Vitebsk Technological Institute, and manager of Laboratory of Problems of Flexible Technology, Valentin Ivanovich Kovalev, deputy chief engineer for new technology of Vitebsk Production Association Monolit, and Valeriy Pavlovich Buyvol, head of Industrial Transport Department, Vibetsk Gorkom, Communist Party of Belorussia, by correspondent V. Ponomarev:
"Flexible Automated Plants: Remove Everything Superfluous"]

[Excerpts] We recall Rodin's half-joking answer to the question "How do you create your masterpieces?" "Very simply," answered the sculptor, "I take a block of marble and I cut out everything superfluous." It is understandable that the artist's workshop and the plant shop are not the same. But let us turn our view toward modern production from this unusual viewpoint. How much here is superfluous! The designers' efforts, expended on drawing the "details," the technical documentation resting in the archives, the metal chips hauled from the enterprise by rail cars--and all this is only to finally produce an industrial "work of art"--perhaps the simplest shaft or gear.

We continue our conversation on flexible automated plants (GAP) and flexible manufacturing systems (GPS), which in combination with automated management and design systems, eliminate the superfluous phases and sections of production, having released the chief "tool" of man--the mind and engineering intelligence--for creativity.

When design and development of flexible plants has entered the practical stage, success now depends on three components: scientific, production engineering and organization. And Vitebsk, where all these factors are being combined successfully, was not selected for the interview without purpose. On the one hand, the republic's only laboratory of problems of flexible technology--one of the main coexecutors of the all-union program for flexible automated plants--operates here in the production institute. On the other hand, the necessary components of flexible manufacturing systems are produced or developed in the city and some enterprises are already fully rearranging their production according to principles of flexible technology. And, finally, attempts are being made ther within the framework of the Intensification program to combine and coordinate the efforts of various enterprises, frequently subordinate to different departments, for more rapid and successful assimilation of flexible manufacturing systems.

Let us present our interviewees: Viktor Ivanovich Goryushkin, head of the Chair of Machine-Building Technology, Vitebsk Technological Institute, and manager of Laboratory of Problems of Flexible Technology, Valentin Ivanovich Kovalev, deputy chief engineer for new technology of Vitebsk Production Association Monolit, and Valeriy Pavlovich Buyvol, head of Industrial Transport Department, Vitebsk Gorkom, Communist Party of Belorussia.

[Question] Viktor Ivanovich, you participated in the All-Union Seminar "Problems of Design and Development of Flexible Automated Plants for Different Sectors of Machine-Building," held at Moscow at the beginning of the year. What is the situation now in this field in the USSR and abroad.

[Answer] According to calculations, the number of workers can be reduced by hundreds in "unmanned" plants. Nevertheless, Soviet (and more than 60 flexible automated manufacturing systems are now operating in the country) and foreign experience indicate successful use of flexible manufacturing systems with lower level of automation. For example, only 10 percent of flexible manufacturing systems in the United States and Japan can be called "unmanned," while all the remaining systems require human participation to one or another degree. But the performance of a machine tool with NC [numerical program control] in even the simplest flexible module is 1.5-2-fold higher than when using it separately.

[Question] How long must one still wait for the proper effect from flexible automated plants? What problems do scientists envision in this regard.

[Answer] V. I. Goryushkin: The Vice President of the USSR Academy of Sciences K. V. Frolov, speaking at the seminar, formulated them thusly: further automation of machine-building, designed and development of new technologies and an increase of the reliability of machines. I would determine a second aspect among these problems: the more so since it also facilitates solution of the two remaining problems. Modern flexible plants are the first generation of flexible automated plants. Only third-generation flexible automated plants can fully implement the "unmanned" principle during 24-hour and year-round operation. But the level of reliability of all the components of flexible automated plants must be increased two-threecold for this. How is this related to technology? I will explain.

The reliability of the flexible complex is in inverse proportion to the number of operations. If, let us say, there are 10 of these operations, then regardless of how perfect the equipment is, failure of one of the sections is probable in 9 of 10 cases. That is, the entire complex comes to a stop. And what is cutting, for example, machining the simplest shaft? These are rough and finish machining in several passes, cutting splines, grooves, threads, grinding and polishing--almost 10 operations.

This is why expenditures (the articles are becoming more complicated) outstrip evermore the saving due to introduction of flexible automated plants. It has been calculated that the maximum automation of traditional cutting technology during the next 5 years may increase performance by only 30 percent. But capital investments will increase 17-30-fold! Incidentally, the capacity and cost of control computer complexes will become an even "steeper," parabolic function of the number of operations.

What is the solution? In reducing these operations. And this is a problem of improving the technology. For example, the use of a cermet, boron nitride or superhard alloy tool makes it possible to produce a final finish and precision of a part during the second pass. Incidentally, economic contract work with Vitebsk enterprises to introduce a superhard tool in lathework is being completed at our department. Having reduced the number of "superfluous" machining phases by two-thirds, we are thus increasing the reliability of the flexible complex sevenfold! As I have already said, simplified technology is easier to automate and requires much less capacity in the control complex, which means that the requirements on the electronics can be reduced.

Departments and subdivisions specializing in flexible automated plants are now being created at many enterprises. But they are usually staffed by specialists in computer hardware. This is a mistake. Success in development of flexible manufacturing depends primarily on technicians. And the task is not only and not so much to improve the old technology as to design and develop an essentially new technology where human participation is not only undesirable but is simply impossible.

For example, does an engine block really have to be manufactured sequentially by casting and milling? And what if it has to be bonded from the thinnest plates similar to those from which transformer cores are assembled? The question is: how to manufacture these plates, is metal generally needed at all, or would it not be better to use polymers? It would seem that technology is only becoming complicated. On the contrary, it optimally corresponds to the requirements of flexibility, reducing the role of man only to design on the display screen.

Of course, a bonded engine is not yet from the realm of fantasy. But essentially, we have already solved the problem with respect to parts of the simplest configurations. This is where the area of application of future flexible automated plants lies--in new methods of shaping: electroerosion, laser, polymer and on the basis of physicochemical processes.

[Question] What else do you feel is hindering the process of assimilating flexible technology.

[Answer] V. I. Goryusykin: Organization of matters is not always skillful. Development of a flexible manufacturing system at a plant is most frequently not prepared and work begins with an order of a superior department. Specialists are forced to proceed from experience. It is good if there are similar plants in the sector where this experience exists. And if not? The only outcome is "engineering." That is, an appeal to intermediate organizations which received the order, examined the enterprise and published a finished design for a flexible automated plant. If there are objections. Well, a second ENIIMS would have to be created in machine-tool building for this. But if one calculates how many people at our plants "invent the wheel" blindly, then I am convinced that not even one ENIIMS would be sufficient in number. In other words, rather many specialists are now practically involved in design and development of flexible automated plants, but the proper effect of their effort is sometimes not evident.

There is also the personnel problem. Flexible manufacturing requires not only new technology by trained engineers as well. Our institute is also participating in solution of this problem: a complete course of machine design has been introduced and the students are mastering the ARM--the automated designer workstation. The working tool of engineers of the new generation is not the pencil, but the computer, graphic and digital displays and the graph plotter. Manufacturing will receive the required personnel within a year or two.

The work of our laboratory is also being restructured. Whereas we were previously involved in problems of traditional technology, this academic year we are switching completing to flexible manufacturing systems. True, problems occur at each step, so there is enough work.

Now, when we know the basic problems faced by the developers of flexible manufacturing system, we will see how they are specifically decided at the plant and namely at the Vitebsk Production Association Monolit.

[Question] As I found out accidentally, your enterprise initially refused planned introduction of several flexible manufacturing systems. Is this true? And if it is true, why is this.

[Answer] V. I. Kovalev: In 1983, we "launched" the task of introducing integrated mechanized sections. A plan is a plan and we prepared our proposals to design and develop three of these sections. But the following year, the question of flexible manufacturing systems was specifically raised for the first time. We again accept the corresponding task. It would seem that a flexible automated plant can be developed in those sections which we had planned to mechanize on an integrated basis. But this is only at first glance. When we analyzed and calculated, it turned out that to squeeze a flexible automated plant into the old production areas by using the old (although essentially new) machines and technology, is impossible. It is one thing to mechanize a section and another to organize production of an essentially new basis. Different--an order more improved--machines, technology and organization are required. It was then decided to begin everything anew. As you can see, the restructuring proceeded very rapidly, literally on the wing. There is still restructuring of only technical thinking. But this is the main thing with respect to flexible automated plants.

[Question] How did you specifically begin.

[Answer] V. I. Kovalev: One should begin in any case with detailed examination of the plant. Since we had essentially covered this stage by analyzing the situation in the sections, there followed the order of the general director of the association "Organize work in development and assimilation of flexible automated plants." A chief of the flexible automated plant was appointed, a specific integrated group of leading specialists of the association was created and their duties in technology, nonstandard equipment and computer hardware were determined in detail. The OTiZ [Department of Labor and Wages] was entrusted with working out the regulations on awarding bonuses to the specialists recruited for the work. A time-table was compiled with rigid deadlines for receipt of equipment, installation of it, adjustment and startup. In short, everything is envisioned, but there are no "details" in this matter. We will receive the finished design at the end of this year, installation of equipment according to the planning

of the flexible automated plant will begin next year and the first flexible modules will be produced in 1987.

[Question] One usually hears that flexible systems are an improbably complicated matter. That years are required just for design. It is easy to be amazed that everything is being done at Monolit: they ordered the design, received the equipment and started it. And there were no problems?

[Answer] V. I. Kovalev: Specialists of the Leningrad Association Pozitron, where extensive experience has been accumulated in design and development of flexible automated plants, rendered great assistance to us. A standard format of the order was even worked out and the duties of the executors were stipulated. For example, this is what the chief technician of the flexible automated plant provides: he works out the technical assignment, prepares the input data for calculation of equipment capacities and supervises development of the ASU TP [automated manufacturing process management system] and the information base. He works out the new production processes and improves existing ones, inscribing them into the automated cycle of the flexible automated plant, and develops the equipment and tools.

Partially the Leningrad specialists and partially the specialists of Monolit "tied in" the standard design of the flexible automated plant to our technology. The same thing occurred with the equipment. Part (mainly the auxiliary equipment) was purchased in finished form, while we are designing and manufacturing the main equipment (we subsequently plan to produce it serially) through our own efforts. Practically everything required for future flexible systems are already in the designs, in the allocated orders and already in finished form.

Construction was more complicated. Complete rearrangement of the basic production shops was actually necessary, and, moreover, under conditions of the existing plant and with a continuous increase of product output. Even the specialized construction trust is "not grabbing" at this work. There remains the cost-accounting method.

[Question] It turns out we are talking about introduction of flexible technology at other than separate, local production sections.

[Answer] V. I. Kovalev: Experience suggests two ways of introducing flexible manufacturing systems: fundamental restructuring of the enterprise and a gradual increase, from individual modules to sections and shops. We are combining both methods. The entire cycle will be encompassed at our branch of flexible technology: from preparation of raw material to assembly of the finished product. And we are beginning at the pilot enterprise with the simplest lathe and milling modules. I will explain. One must "run around" a lot to order the simplest universal machine tool. Ever fewer of these machine tools are being manufactured, while ever more complex, programmable equipment is being manufactured. And this is justified. But it is senseless and disadvantageous to use single machine tools with numerical program control. We have estimated that even five of the most productive machine tools with numerical program control will not bring an appreciable saving. Whether you like it or not, specialists are needed for maintaining them. It turns out that the expenses for repair, adjustment and software are more than the advantages.

Mass use of programmed machine tools is a different matter. This is the first step. The next step is to combine them into lines by using robots, transport facilities, accumulators and storehouses. This is the flexible manufacturing module: machine tool + robot + transport + storage. Only in this way can one fully utilize the potential capabilities of machine tools with numerical program control. We see no other way.

[Question] What saving is expected from introduction of flexible manufacturing systems at Monolit. And how will it be expressed: in rubles, in release of work force or in increase of productivity.

[Answer] V. I. Kovalev: A single billet line will free 15 persons immediately. We already have four of these lines and there will be five more. Calculate for yourself. An assembly line frees another 8-10 persons. Our main plant is now on a good accounting basis--the level of automation comprises 66-68 percent. It will be much higher according to the principle of "flexibility" after restructuring of technology.

I note that we do not immediately expect an appreciable advantage due to introduction of flexible machining modules. Moreover, we allow for the possibility of a negative "effect" and we will proceed consciously toward this. The success of our work during the 12th Five-Year Plan depends on how we assimilate the flexible manufacturing system during the first stage. And the plans are rigid to the maximum extent: the number of workers should be reduced with an almost 1.5-fold increase of the volumes of production. And all this will be due to flexible technology.

[Question] So this means that "the devil is not quite as terrible as painted?" And what about the psychology and restructuring of the traditional engineering thinking.

[Answer] V. I. Kovalev: Like production, we do not have time to rearrange the psychology as we go. We are "swimming," are sometimes lost, like a student at an exam. But we are learning from each other and from our colleagues and are going after experience. For example, a group of workers was recently dispatched to the same Pozitron. We are simultaneously studying the need and formulating applications for engineers of the new generation: electronic specialists, specialists in microcomputers and programmer-technicians. They are now taking their student exams and we ourselves are taking the exam for "flexibility" of engineering thinking, without which flexible technology cannot be assimilated. Introduction of a flexible manufacturing system is now the beginning of fundamental reequipping of Monolit, planned during the 12th Five-Year Plan.

Thus, science and industry are the vuz Laboratory of Flexible Technology and the Association Monolit. Relying on different ministries, they are primarily solving their own, "departmental" tasks, although they are operating in the same direction. This is how the solution of the problem on scales of an industrial region as Vitebsk is seen.

[Question] Valeriy Pavlovich, what are the prospects for introduction of flexible manufacturing systems as Vitebsk enterprises as a whole? How are things currently.

[Answer] V. P. Buyvol: It was recently planned that 15 flexible manufacturing systems will be operational in the city by the end of the 12th five-year plan. But the decimation of the flexible technology is proceeding more rapidly than expected. We will have 20 of these systems judging from everything. And the Association Monolit is not the leader in this area. Flexible technology is being introduced more rapidly at some other plants, for example, in the television industry. I feel that we will be able to demonstrate the first operating flexible manufacturing systems within the next couple of years.

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AUTOMATED LINES AND AGGREGATED MACHINING SYSTEMS

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KHARKOV EFFORTS TO MECHANIZE, AUTOMATE PRODUCTION

Moscow MEKHANIZATSIIA I AVTOMATIZATSIIA PROIZVODSTVA in Russian No 1, Jan 86
pp 8-12

[Article by Ukrainian Communist Party Kharkov Obkom Secretary V. N. Paramonov:
"Kharkov Communists Introduce Production Mechanization and Automation"]

[Text] In his report at the April (1985) CPSU Central Committee Plenum, General Secretary M. S. Gorbachev placed special emphasis on the fact that the party is now promoting cardinal acceleration of scientific-technical progress as the primary strategic lever for intensifying social production.

The Kharkov oblast party organization is giving top-priority attention to questions of improving production efficiency and labor productivity on the basis of retooling, mechanization and automation, and the extensive use of the achievements of scientific-technical progress in various branches of the national economy.

The oblast has a powerful production and scientific potential available to it. It accounts for about eight percent of the industrial production in the Ukraine. The leaders are machinebuilding and metalworking, whose proportion of all output produced is more than 50 percent. About 400 industrial enterprises in various branches operate in the oblast.

Tractor and agricultural machinebuilding, power and electrical machinebuilding, radio-electronics, machine tool and instrument manufacturing, and others are especially well-developed. Our industry produces 25 percent of the country's tractors, about a third of its generators and large electrical machinery, one-fifth of its bicycles, and nearly 90 percent of its commercial air conditioners.

Oblast scientific potential is represented by more than 200 scientific research, planning and design organizations, including six institutes of the UkrSSR Academy of Sciences, 92 branch and planning-design organizations, and 21 institutions of higher learning. More than 70,000 scientists and specialists work here, including 42 members and corresponding members of the Academy of Sciences, upwards of 800 doctors of sciences and more than 8,500 candidates of sciences.

As throughout the country, the necessity of intensifying attention to questions of production mechanization and automation is dictated here not only by the high

rates of development of the national economy, but also by the aggravated labor resources problem. We are now experiencing a shortage of workers in industry, construction and agriculture. At the same time, significant numbers of workers are still employed at unproductive manual labor in industry and other branches of the oblast. This requires immediate solution of the fundamental problem of accelerating in every way possible the introduction of the achievements of scientific-technical progress into production and, on this basis, significantly raising the technical level and effectiveness of production, mechanization and automation, introducing progressive equipment and technology, robot equipment, automated control systems and computer equipment and, in the end, sharply improving labor productivity.

The oblast party organization has accumulated some experience in organizational and political work involving resolving important socioeconomic tasks on the basis of the effective use of the considerable scientific-technical potential available.

Comprehensive plans for improving production efficiency and work quality have been worked out in the oblast in each of the last three five-year plans which have ensured a rise in the technical level of production and, on this basis, meeting the assignments established for production volume growth. These plans are drawn up for each enterprise, branch and rayon.

The indicated work has been done under the leadership of an oblast council, created at the party obkom, for assisting scientific-technical progress; it is headed by the obkom first secretary. Commissions and branch sections are the implementing agencies. Analogous councils and commissions have been created under the party gorkoms and raykoms. Council activity is public, and the important economic leaders, scientists, specialists and party workers are enlisted to participate in its work. A monitoring system has been chosen to ensure unconditional implementation of the measures planned. Progress in carrying them out is reviewed at meetings of the council and commissions, in the branch departments of the party obkom, gorkoms and raykoms, in the primary party organizations, and at rayon conferences with enterprise leaders.

The party obkom branch departments, with the participation of the oblast council, regularly prepare questions connected with accelerating introduction of the achievements of scientific-technical progress and production mechanization and automation for review at byuro and secretariat meetings.

The most important national-economic tasks are being resolved by carrying out the oblast comprehensive scientific-technical target programs. These programs have been approved by the party obkom byuro, and their implementation is monitored by the council for assisting scientific-technical progress and by the party obkom branch departments. The "Trud" [Labor] program has helped improve labor resources planning. The work done on its basis has enabled us to achieve production volume growth in the 11th Five-Year Plan by raising the level of mechanization and automation, improving labor organization and management, strengthening discipline, and increasing personnel organization and responsibility.

The party obkom byuro has now formulated and approved the "Quality" target program. The goal of the work being done within the frame work of this program is to compare the machinebuilding output being produced with the best domestic and foreign analogs and to have enterprises work out and implement a complex of scientific-technical and organizational measures on replacing obsolete machinery, equipment and instruments with newer and more progressive ones which will be competitive in foreign markets in terms of materials- and energy-intensiveness, reliability and durability and which will meet modern requirements. Implementation of this program will require the development and implementation of a complex of measures involving production retooling, introducing progressive and highly mechanized equipment and new resources-conserving technology, and saving raw and other materials and resources. Preliminary calculations show that these measures will save significant amounts of material and energy resources, hypothetically free about 10,000 people for other work, and produce an economic impact totalling 330 million rubles.

The "Production Efficiency and Industrial Enterprise Technical Development Charts" used in the analysis and information system will be an important link in monitoring fulfillment of the planned indicators at each enterprise. They will be used quarterly at the enterprises and in the party obkom branch departments, the raykoms and gorkoms, to analyze trends in the efficiency with which expenditures of labor, capital and resources are used, the indicators of the technical level of production, and progress in introducing progressive developments and in comprehensive mechanization and automation.

The party obkom constantly reveals and supports new beginnings and initiatives by the enterprise collectives which are aimed at increasing production efficiency and intensifying production on the basis of accelerating the introduction of the achievements of scientific-technical progress.

Thus, the initiative of a number of enterprises and institutes under the slogan "Technical Progress -- Key to Efficiency" was universally developed in the oblast in the 10th Five-Year Plan. At the start of the 11th, it was the "Highest Yield from Production and Scientific Potential" initiative. These and other initiatives have merged into a movement under the slogan "Five-Year Plan Assignments Without Increasing Resources," which has been approved by the Ukrainian Communist Party Central Committee. This movement is aimed at improving the technical level of production, providing the entire increment in output at existing production facilities and all growth in amounts of scientific research, development and planning work without increasing the number of workers.

All this has facilitated attaining even better results. During 1981-1984, oblast enterprises put into operation 582 mechanized, flow and automatic lines, switched 299 shops and sectors over to comprehensive mechanization and automation, and increased the number of NC machine tools in operation 1.5-fold.

The introduction of scientific-technical developments into production and the work being done in the oblast to create mechanization shops and sectors at each enterprise (the number of which has been increasing annually by 20-25 units since the start of the five-year plan, with a work volume of about 30 million rubles in 1984) have had a decisive impact on reducing the proportion of manual labor. In industry, the rates of mechanization of manual labor have increased

two-fold, each year freeing for other work about five percent of those employed at manual labor. This has enabled us to reduce the proportion of workers employed at manual from 37.3 percent of all workers to 31.7 percent.

During the 11th Five-Year Plan, the entire increment in production volume in the oblast was obtained without increasing the number of workers, annually freeing more than 800 - 1,000 people for other jobs.

The technical level of many enterprises and associations has been raised, primarily by renovating and retooling existing production facilities and modernizing technological equipment. The rates of labor productivity growth are now 116.7 percent of the 1980 level, two-thirds of which has been achieved by raising the technical level of production. A hypothetical 37,000 people have been freed for other jobs just by introducing new-equipment measures, with a quarter of them being freed by production mechanization and automation and by introducing computer equipment and modernizing equipment.

Scientific, planning-design and technological organizations and industrial enterprises have conducted a number of fundamental research projects, developed new equipment and progressive technology, carried out and are carrying out enterprise retooling plans. The proportion of expenditures on retooling and renovating existing enterprises is half of all capital expenditures. And capital investments are considerably higher in individual branches of industry. Thus, the proportion of expenditures on retooling and renovation at electrical equipment industry enterprises is 71 percent of the total; it is 90 percent in automotive and machine tool manufacturing industry, and it is 100 percent at instrument manufacturing enterprises and in the Ministry of Machinebuilding for Light and Food Industry and Household Appliances. The task has been set of achieving a proportion of expenditures on renovation and retooling of at least 60-70 percent for oblast industry as a whole.

Each year, oblast scientific organizations introduce more than 2,000 scientific developments with an economic impact of 400-500 million rubles. Expenditures on new equipment are compensated in less than two years. There are quite a few examples characterizing the effectiveness of the measures introduced. The assembly of condensers at the "Radiodetal" plant, for example, is done using the "Rotor" automated line, equipped with automatic manipulators; it is the first such line in the branch and has no equivalents anywhere else in the world. This has permitted a three-fold improvement in labor productivity and has freed 340 workers and about 1,600 m² of production space for other uses. And there are other similar examples.

It should be noted that the enterprise party and trade union organizations have become more persistent in dealing with questions of increasing the creative activity of the workers in terms of introducing the achievements of scientific-technical progress. The activities of many public associations of leading production workers, innovators and efficiency experts have increased. During the first four years of the 11th Five-Year Plan, more than 250,000 inventions and efficiency proposals with an economic impact of 481 million rubles, or 50 percent more than in the corresponding period of the preceding five-year plan, were introduced into production in the oblast national economy. The bulk of them were inventions and efficiency proposals aimed at mechanizing production processes and eliminating hard manual labor.

The party raykoms and gorkoms and the enterprise party committees are doing a great deal of organizational work to strengthen production intensification and improve its effectiveness through renovation and retooling. The work being done is based on mechanizing and automating production processes and eliminating manual labor by introducing the achievements of scientific-technical progress.

Production intensification experience at the largest party raykom in Kharkov, the Ordzonikidze, deserves attention. A specific system of work with party organizations and enterprise collectives has evolved and acquired a concrete, purposeful character in the course of carrying out this most important task.

Questions connected with the status of enterprise retooling and renovation and with introducing the achievements of scientific-technical progress into production are regularly brought up for review at the raykom plenums and byuro meetings. Seminars are held with economic leaders and chief specialists and with party organization secretaries to work out the primary areas of effort. At the start of the five-year plan, the party raykom, with the help of specialists and scientists, determined the rayon's most important tasks and worked out comprehensive target programs.

The rayon council for assisting scientific-technical progress, working in close contact with the primary party organizations and the commissions monitoring administration activity, is rendering considerable assistance in leading the industrial economy. The council helps the raykom, party committees and byuros, relying on a large party, trade union and Komsomol aktiv to influence various aspects of life for the labor collectives. The council's work plans are inter-linked with the work plans of the party raykom departments and byuros, which helps it resolve the tasks facing rayon industry in a broad, skilled manner.

Such work organization has permitted comprehensive mechanization of one in every five shops and sectors at rayon enterprises and raising the equipment operation shift index in basic production to 1.68. Given 16.6 percent production volume growth during the first four years of the five-year plan, metal consumption has increased only two percent, electric power consumption eight percent and boiler-furnace fuel consumption three percent.

The party raykom is striving to make better use of its right to monitor economic activity. The party raykom byuro regularly hears reports by the leaders and secretaries of party organizations. This creates an atmosphere of personal responsibility and forces economic and engineering personnel to seek out newer and more effective decisions.

The collective of the "Kharkov Tractor Plant imeni S. Ordzhonikidze" PO worked out a comprehensive program to solve the problem of reducing manual labor in 1981-1985. Its primary focus is accelerating the mechanization of manual jobs, and foremost of difficult, labor-intensive and hazardous ones. The program anticipates switching more than 1,500 people from manual to mechanized labor. They have already switched 160 people in metallurgical production shops, 33 people in welding production shops and 63 people in tool production shops to mechanized labor. The labor of 156 workers employed in transport operations has been mechanized by introducing mechanized equipment, packet and containerized shipping and better labor organization. Some 145 industrial robots are working at various technological process stages in the enterprise.

In sum, 1,400 people have now been switched from manual to mechanized labor at the association through implementation of the measures anticipated by the program. A comprehensive program for reducing the use of manual labor anticipating the transfer of 2,500 workers from manual to mechanized labor has been worked out for the 12th Five-Year Plan.

Similar work is also being done at the "Serp i molet" PO, where the proportion of manual jobs has been cut from 24.2 to 22 percent and is to be reduced to 15 percent in the 12th Five-Year Plan.

Questions of mechanizing and automating production processes and reducing manual labor are closely scrutinized at the Machine Tool Manufacturing Plant imeni S. V. Kosior, which operates four comprehensively mechanized shops and eight sectors. The machine shop has set up four NC-machine tool sectors which perform 75 percent of the turning, 70 percent of the drilling and 80 percent of the boring work. Each year, the plant switches up to 250 different parts to machining on NC machine tools. Six "machining center" machine tools have also been introduced. The introduction of guide-frame conjugate grinding in place of manual scraping permitted eliminating an assembly bottleneck. Fifty scrapers were freed from hard manual labor, and the economic impact totalled 150,000 rubles.

The "Elektromashina" plant has achieved significant results in labor productivity growth by raising the technical level of production and by mechanizing and automating technological processes, reducing the proportion of manual labor by using mechanization and automation equipment manufactured on the premises. The level of production of such equipment at the plant has increased 2.5-fold in the 11th Five-Year Plan. The mechanization and automation shop manufactures various fixtures, as well as semiautomatic machine tools and automated and mechanized lines. It is combined with the mechanization and automation department, permitting accelerated introduction of the plant's own developments into production and obtaining a faster return on them. The introduction of shop-manufactured mechanization devices has had an economic impact totalling 2.2 million rubles in the five-year plan. The level of mechanization of basic production has reached 79 percent and will be 85 percent at the end of the 12th Five-Year Plan.

The attainment of these results has largely been facilitated by purposeful work by the party committee as concerns questions of accelerating scientific-technical progress, production automation and mechanization, and saving all types of resources. Party committee commissions for individual areas have been created and are actively at work. Leading experience and scientific and technical achievements are heavily propagandized.

The work experience of collectives at the "Elektromashino," "Konditsioner" and 8th GPZ [state bearing] plants on creating specialized enterprise shops to produce mechanization equipment and subdivisions to design them has been approved by the party obkom byuro and recommended for dissemination to oblast enterprises. By the end of the current five-year plan, the capacities of such subdivisions are to have been increased two-fold at all oblast enterprises.

The branch scientific research and planning-design organizations make a significant contribution to raising the technical level of production. Cooperation

between the VNIIITelektromash [not further identified] institute and the "Ukr-elektromash" PO and other enterprises of electrical equipment industry merits attention. The institute has accumulated experience in improving specific technologies to replace manual with machine processes. The work is being done on the basis of long-term target programs for developing technology and equipment to produce electrical machinery. Automated lines and unitized and modular machine tool systems ensuring three-fold labor productivity growth have been created and introduced. The "research - introduction" cycle has been shortened to 2.5 years here through creative cooperation agreements between the institute and the plant.

The institute has created about 100 progressive new processes and 160 different models of automated equipment. The annual economic impact just of introducing [one] technological complex at the KhELZ [Kharkov Electrical Equipment Plant] is 300,000 rubles. The institute's efforts are currently focused on developing flexible manufacturing systems.

The cooperation between collectives at the VNIIgidroprivod Institute and "Gidroprivod" plant, the Scientific Research Institute for Automating Control and Production and the Machine Tool Manufacturing Plant imeni S. V. Kosior, and between the Ukrorgstankinprom and tool and machine tool manufacturing plants have produced positive results in accelerating the introduction of developments into production.

Work being done by the institutes and plants on the basis of creative cooperation agreements is constantly monitored by the party organizations. Progress in implementing them is discussed as combined party committee meetings, where concrete steps to accelerate the introduction of developments into production are planned. By mobilizing workers to accelerate introducing the achievements of scientific-technical progress and increasing the effectiveness of industrial production, the party organizations are striving to continue improving the style and methods of their own activity involving raising the technical level, increasing production mechanization and automation, and eliminating manual labor.

Without question, we have not used every reserve available at every enterprise and have not fully brought into play the efforts of scientists and specialists at the scientific research, planning-design and technological institutes, VUZ's and design bureaus to increase the effectiveness of labor and accelerate introducing the achievements of scientific-technical progress into production.

A number of enterprises are still slow in introducing progressive technological processes, NC machine tools and flexible readjustable complexes. All this makes it harder to ultimately solve the manpower shortage problem by compensating for it through the use of mechanization and robot equipment. Therefore, all efforts are now aimed at seeking out and bringing into play additional production reserves.

Comprehensive measures are being worked out for the 12th Five-Year Plan on re-tooling industrial enterprises and extensively introducing the achievements of scientific-technical progress. In particular, they outline:

developing and introducing flexible manufacturing and robot-equipment complexes;

organizing the production of and introducing industrial robots;
creating plant-wide (intershop) and intrashop automated transport systems;
introducing NC machine tools;
developing comprehensively-mechanized and automated shops and sectors;
introducing automatic, comprehensively-mechanized and flow lines;
creating and developing subdivisions specialized to produce equipment for
mechanizing and automating production processes;
job descriptions and certification.

Considerable attention has been paid to mechanizing and automating auxiliary processes which, as we know, account for more than 30 percent of labor expenditures in industry.

We intend to raise the level of basic production mechanization as a whole to 75-80 percent and the level of mechanization in loading-unloading, transport and warehousing to 85-90 percent. In carrying out these measures, 30,000 to 40,000 workers will be switched from manual to mechanized labor during the five-year plan.

These are our main lines of effort in intensifying production, including the mechanization and automation of production processes and eliminating manual labor, which will enable us to carry out the resolutions of the 26th CPSU Congress, as well as those of the April and October (1985) CPSU Central Committee Plenums and party and government decrees on these questions.

Our labor collectives have prepared a worthy greeting to the 27th CPSU Congress.

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AUTOMATED LINES AND AGGREGATED MACHINING SYSTEMS

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SELECTING BEST STRUCTURE FOR FLEXIBLE PRODUCTION SYSTEMS

Leningrad IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: PRIBOROSTROYENIYE in Russian
No 1, Jan 86 pp 94, 96

[Article by N. V. Zakharov, S. F. Sobolev, Leningrad Institute of Precision Mechanics and Optics]

[Abstract] The optimal composition of flexible production systems within flexible manufacturing systems [GAP], flexible automated sections or flexible automated lines is discussed. A series of formulas is presented to determine the level of productivity of a flexible production system and two graphs illustrate changes in the productivity of the system under varying degrees of differentiation in the processes and changes in productivity with the use of a memory device. The authors mathematically analyze various other aspects and factors in selecting the most efficient variants and means of combining system components. 2 graphs, 3 references, 1 German, 1 English and 1 Russian

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ROBOTICS

UZBEK OFFICIAL DISCUSSES ROBOTICS

Tashkent EKONOMIKA I ZHIZN in Russian No 1, Jan 86 pp 30-31

[Interview with Valentin Alekseyevich Nikiforovich, director of the subdivision for interindustrial processes and introduction of automatic manipulators and robots: "Robotization -- The Chief Reserve for Increasing Labor Productivity". Time and place not given]

[Text] [Question] Valentin Alekseyevich, technical progress in industry is above all the switch to completely new technologies and the attainment of a higher level of production. The common denominator for such progress has appeared and it is robotization. How do you define that term?

[Answer] Robotics and robotic equipment refers to industrial robots or automatic manipulators with program control from built-in minicomputers. These robots and manipulators can perform several assigned tasks. The term also includes balanced (operator controlled) manipulators, automatic operator-free manipulators and the simplest "mechanical arm" manipulators.

Robotic production complexes consist of robotic equipment included within a closed technological cycle of numerical-control and adjustment devices. This is the simplest form of adjustable automated flexible production systems. It can also include individually functioning items of equipment such as that serviced by the operating personnel.

[Question] Which plants in Uzbekistan are introducing this technology and at what pace?

[Answer] Most of all, robotics is being introduced at the plants of the machine-building and metal-working industries equipment where there is a high level of heavy manual labor under harmful working conditions. In the first year of the last 5-year period, a total of 43 robotic items were introduced while in the last few years, we have seen the introduction of 101, 112 and 144 such devices. In 1985, 135 robotic devices were expected to be introduced.

[Question] What sort of economic savings can be expected from the introduction of robotics?

[Answer] It is still too early to say whether robotics has produced any great effect that has fundamentally changed the work of industry. The percentage of manual labor is still high at this time. All the same, the economic savings obtained through the use of robotic technology amounted to more than one million rubles in 1985 alone.

At the start of the 5-year period, there was a race to introduce a large number of robots to industry. The ministry distributed them equally among their various establishments but this "method" turned out to be a defective one and economically inconvenient for plants. It became necessary to create new specializations and services to maintain the new robotic equipment and this included programmers, electronics specialists and software specialists.

The amount of introduced robotic equipment falls far short of achieving the expected results. A robot or manipulator is most often replaced by a worker for a specific operation. The economic result is judged according to the worker's pay and that makes the robot an expensive machine. Robots produce their greatest economic result when operated in a robotic production complex when with their help various NC machines can be merged together to form automated sections or lines and flexible production systems.

Our past experience has been considered and now the introduction of robotics into factories is being carried out according to the plans and programs of the ministries and departments whose organizations include scientific research institutes, design bureaus and experimental factories. An example of this in our republic is the Tekhnolog Science and Production Association which completely monitors all of the work at the Soyuzmashkhlopkovodstvo State production Association connected with the mechanization and automation of technological processes that use robotics.

Of all the republic's enterprises, the leader in introducing robotics is the Tashkent Tractor Factory Production Association imeni 50th Anniversary of the USSR. This plant has created a special demonstration section combining 31 different metal-working machines and 21 industrial robots equipped with gear made by the plant itself. This establishment has introduced over 40 balanced manipulators for material handling work. Unfortunately, this factory is the only such example. Automation and the use of robotics only interest those factories in which it has become an urgent need and that is generally the modern, well-equipped and highly-productive establishments. Nearly half of the machine-building plants and other industrial factories have in the last 5 years only studied where robotics in their establishments are necessary.

As a rule, plans to introduce new technology are never completely implemented. Many of these plans need serious reconsideration.

In formulating their plans for new technology for 1986-1190 and the period up to 2000, the ministries and departments, science-research associations and factories must more actively certify and streamline their workplaces because that is the only way that they can most accurately determine the places in strong need of faster mechanization and automation of production processes.

[Question] Only 10 years ago, Uzbekselmash was one of the first production associations in the republic to start introducing NC machines. For various reasons, many of these prematurely went out of order and practically no one can repair them. There has been a similar situation with new equipment at many other plants. Our journal has also noticed that it has now become really necessary to create in Tashkent an interindustrial regional center for the start-up adjustment of robotic equipment, repair and technical maintenance. How realistic is it to create such an establishment?

[Answer] In Uzbekistan, a section for technical service of NC machines and industrial robots was organized on the initiative of the republic's ministry of machine-building industry. There are also prospective plans to build a separate production facility to be assigned to the Tashkent Technical Service Center with a work volume of 1.4 million rubles. This facility is supposed to go into operation in 1998. It is entirely probable that it will open much sooner.

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ROBOTICS

ERGONOMIC RESEARCH IN ROBOT ENGINEERING

Moscow TEKHNICHESKAYA ESTETIKA in Russian No 1, Jan 86 p 18

[Untitled article by Corresponding Member of USSR Academy of Sciences Ye. P. Popov, manager of Scientific Academic Center Robotics, USSR Academy of Sciences, and USSR Ministry of Higher Educational Institutions]

[Text] Ergonomic research is capable of increasing the efficiency of robotics significantly, especially where remotely controlled robots and manipulators are used. Scientific research work, related to systems for remote control of manipulators, were begun at MVTU imeni N. E. Bauman [Moscow Higher Technical School imeni N. E. Bauman] in the 1960's. At the same time, these were well-known duplication manipulators for working with closed chambers contained radioactive materials (they then began to be used in other areas as well and under different extreme conditions).

The human operator observed the process in the chamber visually through a glass protective port or on a television screen. The operator's actions in the duplication system had extreme low efficiency and were very fatiguing. Ergonomic research showed that force sensations from the work performed in the chamber must be transmitted to man to supplement the visual observation channel. This brings his actions closer to the normal working process, for which the effect of being present is typical.

The corresponding engineering units were developed in different versions (so-called reversible systems and two-way action systems). As a result, the efficiency of the operator's actions with the duplication manipulator increased literally by an order of magnitude in speed and quality of performing the operation. Different versions of systems with force sensing were dictated by the fact that man is not always able to apply force continuously and he should be freed temporarily from these efforts according to one or another principles as a function of the nature of work so as not to induce excessive fatigue.

This concerned the observation channel in the duplication system. The control channel however required that the operator perform ever more complicated and large movements required for work with his own hands on the control unit, kinematically similar to the operating manipulator. Therefore, a semiautomatic system with control lever was developed, which operates from the operator simply pressing his hand in one or another direction. Signals are fed from the lever to a special calculator, which generates the corresponding control signals

and directs them to the working manipulator. Serious ergonomic research was required so that the control lever be convenient to operate and so that the total organization of the system yield the best operating efficiency.

The next step was to robotize this system, that is, to design and develop automatic actions of the working manipulator according to a given program (for individual parts of the total operation) so as to free man from manual work on the control unit. But control of some part of the total operation, not subject to automation, remained manual--remote (duplication or semiautomatic). In this case the main task of ergonomics was optimal determination of the degree of automation of the system and of the fraction of manual control in each specific application of this combined man-machine system. This is also of economic significance.

Finally, when using an adaptive robot with artificial intelligence components, interactive operation of the human operator remotely with the robot in a closed room is organized through computer hardware. This has its own specific level of ergonomic research. This type of system has not yet been achieved.

One must say that robots and manipulators, controlled remotely by a human operator, are finding ever greater application under production conditions in all the industrially developed countries of the world, even in ordinary production shops. But this problem becomes especially acute in the coal, construction and timber industries and certain other industries. Specialists of the Scientific Academic Center Robotics, USSR Academy of Sciences, and USSR Minvuz, jointly with representatives of the corresponding departmental organizations, were involved in solution of it. A number of ergonomic problems, related to interaction between the human operator and the robot, must be solved to achieve economic effectiveness and high performance of these systems. However, when conducting this work, we encountered a number of difficulties and primarily a shortage of specialized equipment for ergonomic research. This problem must be solved by using the corresponding subdivisions of GKNT [USSR State Committee for Science and Technology].

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ROBOTICS

ORGANIZATION, ROLE OF 'INTERROBOT' ASSOCIATION VIEWED

Moscow KOMMUNIST in Russian 18 Mar 86 p 3

[Article by V. Petrunya, TASS commentator]

[Abstract] The article provides information on the organizational structure of the recently created international research-and-production association "Interrobot," and on this association's role in the advancement of robotics research in member-countries of the Council for Mutual Economic Aid (CEMA). The "Interrobot" program reportedly is to be coordinated by the Soviet inter-industry scientific-technical complex "Robot," which has been appointed the chief organization of the association.

The new association's objective is to develop a system of unified robots for various purposes, according to CEMA secretary V. Sychev. These robots will be used both independently and as parts of automated complexes. N. Panichev, chairman of the coordinating council for flexible production systems and industrial robots of CEMA's committee for cooperation in the field of machine building, mentioned some of the main tasks which "Interrobot" is to accomplish in this connection. They include preparing specifications for new robotic equipment, defining and approving a standard-type series of promising models, putting the modular-unit principle of designing into practice, unifying components and apparatus, and developing more reliable control devices. A designers' council is to perform functions of coordinating research and design work and ensuring a unified scientific-technical policy in the association.

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ROBOTICS

METHODOLOGY FOR CALCULATING EFFICIENCY OF FLEXIBLE SYSTEMS

Kiev EKONOMIKA SOVETSKOY UKRAINY in Russian No 1, Jan 86 pp 57-61

[Article by N. Skvortsov, professor, doctor of economic sciences]

[Abstract] At the present time, the use of programmable robot-manipulators is one of the chief directions in the automation of industry. The efficiency of flexible manufacturing systems [AP] is largely determined by the level of training and skill of the operating personnel. The economic efficiency of a GAP is determined by comparing the total capital investment costs, the degree to which human labor is freed and how adaptable the system is to changes in production. Continuously operating systems must be highly-ready to work according to a given formula. Important indicators of system efficiency are the coefficients of technical utilization, readiness, operation, compatibility, level of production automation and other such coefficients. These coefficients are defined in some detail and the formulas used to calculate them are presented. No single one of these coefficients can be used alone to determine efficiency. A comprehensive approach is required that consider not only the positive factors of system operation but also the negative ones. A formula is presented for determining the efficiency of the use of single robot-manipulators and a table presents data on how much human labor is freed by the use of robots. A formula is given for determining the economic effect of creating and using one robot within a GAP. Robots involve substantially different production costs connected with the preparation and operation of control programs. Added expenses associated with GAP's are those caused by the changed human role within the ergonomic system or by poor organization or workers. Formulas are given that calculate the new wage expenses according to profession and type of work as well as the costs of repair and maintenance for GAP's. The social and economic effects are calculated on the basis of factors such as the reduction of losses due to worker turnover and involvement in the production process (error, time off from work, etc.) and reduction of expenses for worker social needs or improving working conditions. The use of GAP makes it possible not only to reduce the production cycle by lowering the labor-intensiveness of various processes but also allows rapid adjustment of production to new parameters. A formula is given to calculate the operational flexibility of a GAP. Robots do have certain limitations in that they lack the necessary degree of sensory perception and cannot be communicated with vocally.

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ROBOTICS

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IMPLEMENTATION OF ROBOTS AT MOTOR VEHICLE PLANT IMENI LENINSKIIY KOMSOMOL

Moscow AVTOMOBILNAYA PROMYSHLENNOST in Russian No 12, Dec 85 pp 27-29

[Article by I. S. Mitin]

[Abstract] The introduction of robots at the Lenin Komsomol Plant is described. Robots are viewed as an additional means for solving automation problems, rather than as omnipotent devices. The use of robots is recommended wherever technology has stabilized and reached a fairly high level of automation, but where manual labor has not been entirely eliminated. When deciding to use robots to automate production processes, allowance must be made for the substantial time and resources required for initial preparation. Experience gained with the use of different models of manipulators and robots, including MP-9S, the RB-231, and the RB-211, is described. Figures 3.

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